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Understanding retirement in the UK:

An empirical analysis

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Statement of conjoint work

Three (out of six) chapters of my thesis represent joint work with different co-authors. They are:

Chapter 2 What can we learn from retirement expectations data? Joint work with Professor Richard Disney (University of Nottingham and Institute for Fiscal Studies). Professor Disney and I contributed equally.

Chapter 4 Pension Incentives and the timing of retirement. Joint work with Professor Richard Blundell and Professor Costas Meghir (University College of London and Institute for Fiscal Studies). Professor Blundell, Professor Meghir and I contributed equally.

Chapter 6 The Labour supply effect of the abolition of the earnings rule for older workers. Joint work with Professor Richard Disney (University of Nottingham and Institute for Fiscal Studies). Professor Disney and I contributed equally.

Signed..... (Sarah Smith) Date .....

(signature of student)

Signed..... (Professor Richard Blundell) Date .....

(signature of principal supervisor)

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And last, but by no means least, thanks to Paul, who has always been there.

Abstract

Like most OECD countries, the UK has experienced a long-term trend towards earlier retirement, beginning in the 1970s, a trend that has only recently been reversed. The aim of this thesis is to shed light on these trends.

Chapters 1 – 3 consider the nature of retirement. Economic models typically assume that retirement is voluntary, discrete and irreversible, and synonymous with drawing a pension, and this has been the dominant pattern for men in the UK. But there is a large minority, typically those with low wealth, for whom the path to retirement is through unemployment or long-term sickness and for whom unemployment and disability benefits provide alternative early retirement vehicles. Analysis of retirement expectations show that shocks to health and to marital status cause retirement plans and outcomes to diverge. The distinction between "voluntary" and "involuntary" retirements is important in understanding the well-documented fall in spending that occurs after retirement (the "retirement-consumption puzzle"). Spending falls significantly only when retirement is involuntary, a finding that is consistent with a negative wealth shock arising from involuntary early retirement lying behind the puzzle.

Chapters 4 – 6 explore the responsiveness of the labour supply of older workers to incentives in state and private pensions. Pension wealth and accrual are shown to have significant effects on retirement, at least for the state pension and for defined benefit occupational pensions. However, early evidence suggests that wealth in defined contribution schemes does not have the expected positive effect on retirement, a finding that is consistent with their greater flexibility. The labour supply of older workers is also shown to be affected by earnings tests; the removal of such a test in the UK is estimated to increase average weekly hours by three – four hours for men and two hours for women.

Table of contents

Overview

Over the past few decades, while life expectancy has increased, there has been a trend in the UK, as in other OECD countries, towards earlier retirement. As shown in the table below, the average retirement age fell from 65 to 61 between the cohorts born 1900 and 1935. Combined with longer life expectancy and an increased time spent in education, this lead to a 10 percentage point fall in the proportion of life spent working. Among the explanations for falling activity rates are the disincentive effects created by social security and pension systems and the relative disadvantage of older workers during a period of industrial re-structuring and technological change, as well as rising levels of wealth which have afforded individuals a longer period in retirement.

Education, retirement and life expectancy by cohort in the UK

Cohort born in	Mean age left school	Median retirement age	Life expectancy if reach age 55	Proportion of life spent in labour market
1900	14.1	65	73.5	0.69
1910	14.6	65	74.0	0.68
1920	14.8	63	74.5	0.65
1930	15.2	62	75.5	0.62
1935	15.9	61	76.7	0.59

Source: Banks and Smith (2006)

Age left school and retirement age calculated using data from the Family Expenditure Survey. Data on life-expectancy from ONS Population Trends (2004).

Note: Cohorts are five-year cohorts beginning with listed year (so 1900 refers to the cohort 1900-1904 etc.)

This trend has only very recently been reversed since the late 1990s. The almost

continuous rise in employment since 1992, affecting older workers as well as younger, is likely to be one key contributory factor. The tightening of early retirement windows in defined benefit occupational pensions and, possibly, the transition from defined benefit pensions to defined contribution pensions, is another.

This thesis sheds light on these trends by presenting empirical analysis of a number of issues relating to retirement in the UK. Chapters 1 – 3 are primarily concerned with the nature and consequences of retirement. Chapters 4 – 6 are primarily concerned with the responsiveness of the labour supply of older workers to incentives in state and private pension schemes.

Chapter 1 presents key stylized facts on retirement in the UK. After documenting the main trends in retirement over the past thirty years, it looks at the main pathways into retirement. The dominant pattern for men is one of voluntary, early retirement (ie before the state pension age) onto a private pension straight from (full-time) employment. However, for those with no occupational pension, unemployment benefits, means-tested income support and, more commonly, disability benefits provide alternative early retirement vehicles. For those with low levels of qualifications, levels of non-work are high, even among those in their 40s and 50s, and 'retirement' is typically via another non-working state (unemployment or long-term illness/ disability).

Chapter 2 analyzes data on retirement expectations in the UK Retirement Survey. At first sight, the data suggest that, even among a cohort close to retirement, there is little evidence of planning for retirement. Unlike the distribution of actual

retirement ages, the distribution of expected retirement ages is very heavily dominated by the state pension ages (65 for men and 60 for women), while a high proportion say that they don't know when they expect to retire. Nevertheless, expected ages of retirement do vary plausibly in line with covariates, implying that individuals do not simply report random numbers. Moreover, reported expectations appear to have additional predictive power for actual retirement behaviour, above their correlation with individuals' observable characteristics. On average, though, men retire earlier than expected. There is evidence that shocks to health and to marital status may cause retirement plans and outcomes to diverge.

Chapter 3 examines whether differences in the nature of retirement – and in particular the distinction between voluntary and involuntary retirement (ie retirement that is earlier than expected or desired) – might be able to explain the well-documented fall in spending that occurs after retirement (the "retirement-consumption puzzle"). Using data from the British Household Panel Survey, it finds that food spending falls significantly only when retirement is involuntary and not when retirement is voluntary. This finding is robust to alternative definitions of retirement and cannot be explained in terms of differences in pension status and levels of education between voluntary and involuntary retirees. This finding is consistent with the fall in spending at retirement being caused by a negative wealth shock arising from involuntary early retirement.

Chapter 4 provides an empirical evaluation of the economic incentives for retirement underlying the UK pension system. The probability of retirement between the two waves of the Retirement Survey (1988/9 – 1994) is modeled as a

function of (imputed) pension wealth and accrual in state and defined benefit occupational pension schemes and other demographic control variables. Within the cohort born 1919-33, there is sufficient variation in pension wealth and pension accrual arising from the maturing of the State Earnings Related Pension system and diversity in employer-provided occupational pensions to allow estimation of pension incentive effects. The results point to significant effects of pension wealth and accrual on retirement. In particular, they confirm that (defined benefit) occupational pension incentives encourage early retirement.

Chapter 5 extends the analysis of the effects of pension incentives on the timing of retirement to examine the likely consequences of the shift from defined benefit to defined contribution schemes. It simulates pension wealth and accrual for a representative individual in typical DB and DC schemes and predicts retirement probabilities at different ages. While DB schemes typically concentrate retirement around normal or early retirement ages, DC schemes are associated with a smoother spread of retirements. Using recent data from the English Longitudinal Study of Ageing, it models the probability of retirement as a function of DC, DB and state wealth and accrual. While DB and state pension wealth have the expected positive (and significant) effect on the probability of retirement, the results suggest no effect of DC pension wealth, which is consistent with their greater flexibility. In general, the results suggest that DC pensions are associated with later retirements.

Chapter 6 assesses the effect of the abolition of the UK state pension earnings test on the employment of older workers. *A priori*, the effect of the reform is ambiguous. People who are currently earning at or near the earnings test threshold

are likely to have an incentive to work more. But a second group of people will experience a positive income effect as a result of abolishing the earnings test and this second group may actually reduce their hours and earnings. Estimates using a differences-in-differences approach suggest that the reform had a positive effect on employment, increasing average hours worked by men and women by around 3 – 4 hours per week and 2 hours per week respectively.

Chapter 1: Retirement in the UK

This chapter sets the scene for the rest of the thesis by presenting some descriptive information on retirement and pensions in the UK. It documents the main trends in labour market participation among older workers over the past thirty years and the nature of individual pathways into retirement and describes the main features of the UK pension system.

1.1 Trends in labour market participation

Over the past few decades, while life expectancy has increased across OECD countries there has been a near-universal trend among men to leave the labour market at younger ages (see Blöndal and Scarpetta, 1999).

Figure 1.1 plots employment rates for men in the UK, by age, over a thirty-five year period from 1968 – 2002.[1] It shows clearly the fall in employment[2] among older workers that occurred over this period, particularly among those aged 55 and

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[1] All figures in this section are based on data from the Family Expenditure Survey 1968-2002.

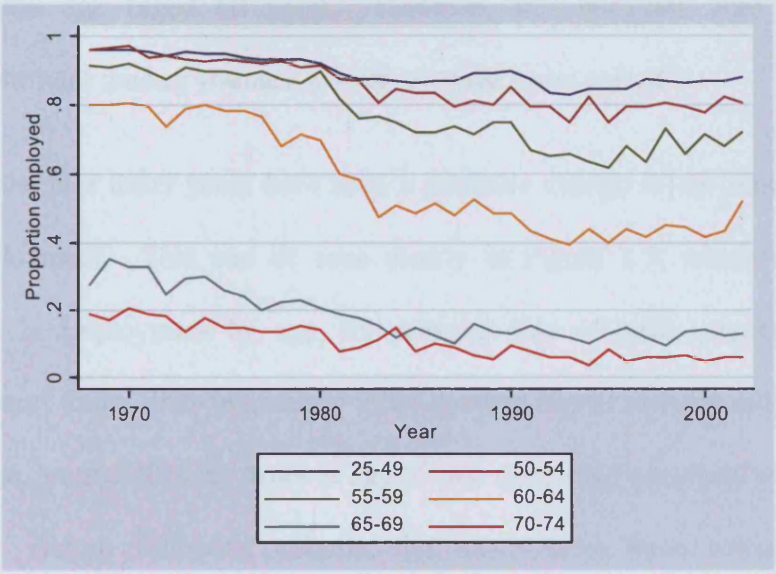
[2] Including self-employment. Within those employed, there has also been a shift from employment to self-employment.

above.[3] Much of the decline in employment among older workers occurred during the early 1980s, a period of recession in the UK, suggesting that older workers may have been hit particularly hard by the industrial restructuring that occurred. Banks and Casanova (2004), for example, show that there has been a decline in the relative real wages of older workers (particularly the low-skilled) in the UK. In practice, a combination of low wage opportunities, together with the availability of early retirement windows in occupational pensions and long-term disability benefits (invalidity benefit and then incapacity benefit) is likely to have encouraged permanent labour market exit among older workers (see Disney, 1999). Only in very recent years, after a sustained period of economic growth, has the fall in employment begun to be reversed (see Disney and Hawkes, 2003).

[3] The state pension ages for men and women are 65 and 60 respectively. The state pension age for women will gradually be increased to 65 between 2010 and 2020. The government has recently proposed raising state pension ages for both men and women to 68 by 2050.

Figure 1.1

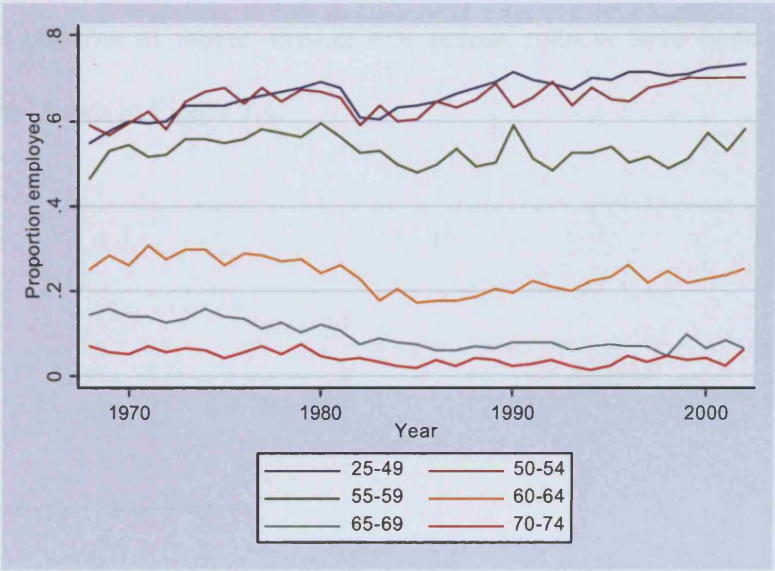
Employment rates among men, by age



Source: Family Expenditure Survey 1968 – 2002

Figure 1.2

Employment rates among women, by age



Source: Family Expenditure Survey 1968 – 2002

For women, the story is quite different, as shown in Figure 1.2. The fall in employment among older women has been smaller, and limited to those above the state pension age (aged 60 plus). However, this contrasts with a rise in employment rates among younger women over the same period.

For men, the past thirty years have seen a dramatic change in the timing of exit from employment. This can be seen clearly in Figure 1.3, which shows the proportion in employment by age, for selected date of birth cohorts. Of the earliest cohort (born 1905-09), nearly three-quarters stayed in work until the state pension age, around 40% left work at age 65 and more than one-third worked past this age. Across following cohorts, the trends have been towards earlier employment exit, more dispersed employment exit, and far fewer men in work after the state pension age.[4] Of the cohort born 1935-39, one-quarter had already left work by age 55 and half by age 60; fewer than 20% left at the state pension and only around 15% worked after age 65. For women, by comparison, the changes in patterns of labour market exit across cohorts have been much less dramatic, as shown in Figure 1.4.

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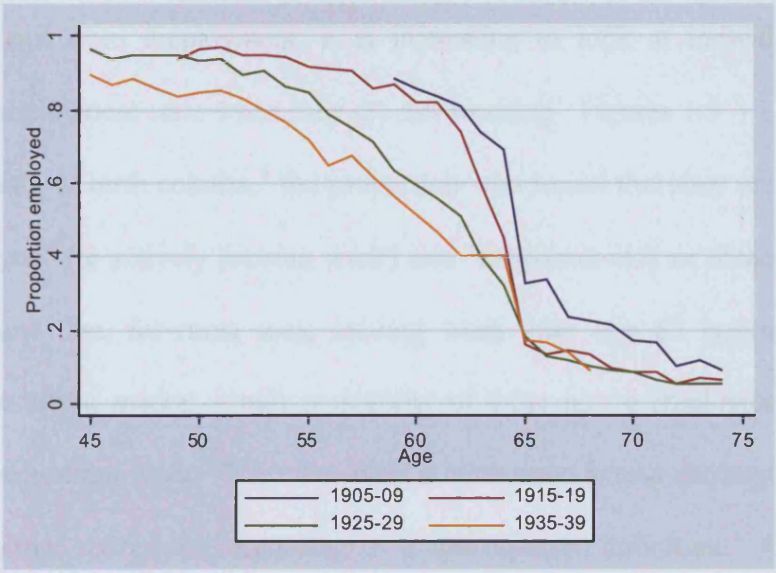
[4] Some of the explanation for this might be increased survival, although the increase in life expectancy, conditional on surviving to age 55, has been relatively modest from 73.5 for the cohort born 1900-04 to 76.7 for the cohort born 1935-39.

Figure 1.3

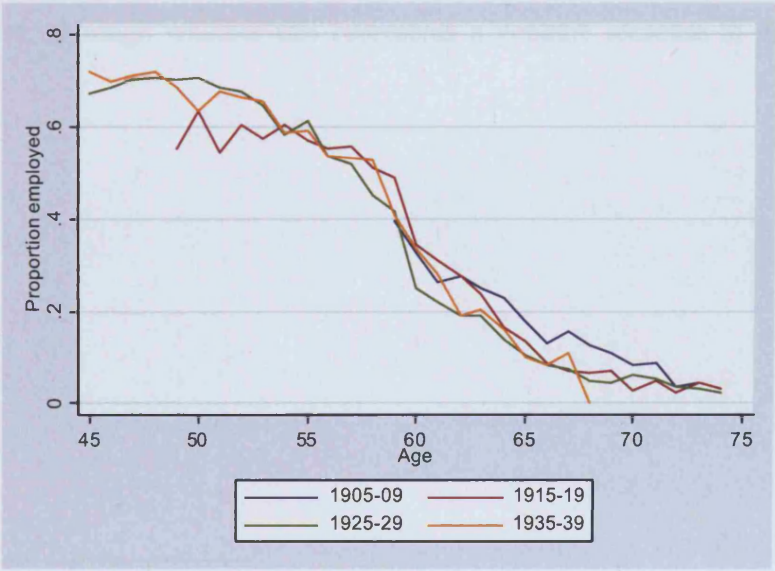
Proportion of men in employment, by date of birth cohort



Source: Family Expenditure Survey 1968 – 2002

Figure 1.4

Proportion of women in employment, by date of birth cohort



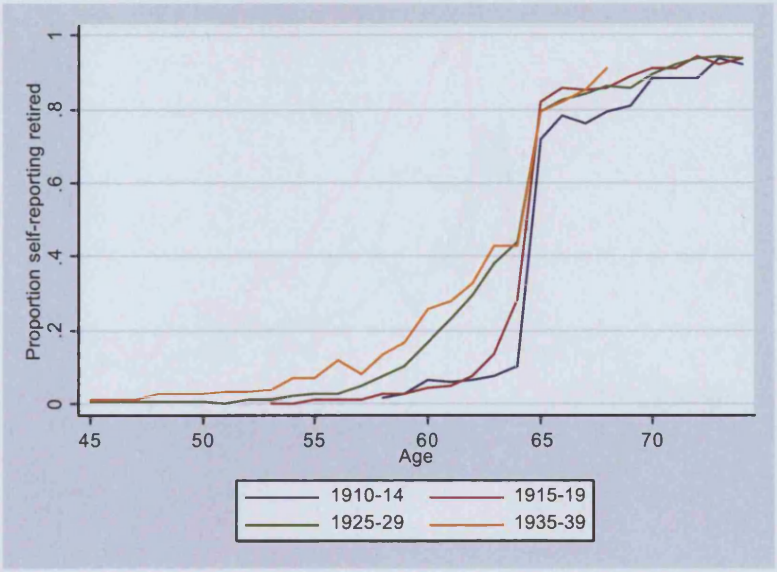
Source: Family Expenditure Survey 1968 – 2002

To begin to understand what lies behind the trend towards earlier and more dispersed exit from employment, it is interesting to look at individuals' self-reported employment state when they are not working. Figures 1.5 – 1.7 plot, for different date of birth cohorts,[5] the proportion who report that they are "retired", "unemployed" (ie actively seeking work) and "long-term sick or disabled". The figures show that, for most men, leaving work after age 55 typically means leaving the labour market – only a minority of those not in employment beyond this age are seeking work. There has been a clear trend across successive cohorts towards earlier retirement, according to a self-reported definition. Among the 1935-39 cohort, more than 40% consider they are retired before the state pension age, compared to around 10% in the 1910-14 cohort. But there has also been an increase in the proportion reporting that they are sick. This has been reflected in a four-fold increase in the number of people claiming disability benefits over the same period, although whether this represents a genuine increase in disability is less clear.

[5] This information is only available from 1972, which is why the first cohort chosen is born 1910-14.

Figure 1.5

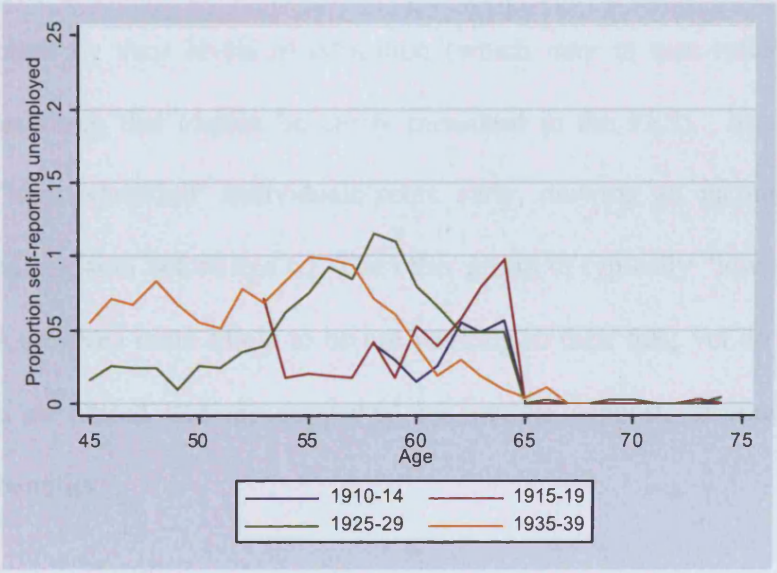
Proportion of men reporting they are retired, by date of birth cohort



Source: Family Expenditure Survey 1972 – 2002

Figure 1.6

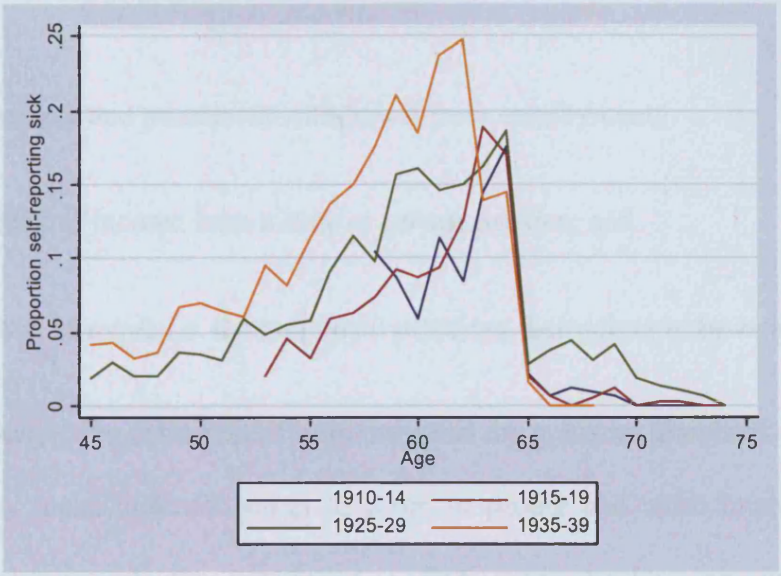
Proportion of men reporting they are unemployed, by date of birth cohort



Source: Family Expenditure Survey 1972 – 2002

Figure 1.7

Proportion of men reporting they are sick, by date of birth cohort



Source: Family Expenditure Survey 1972 – 2002

As is explored in more detail in the next section, what emerges from the analysis of labour market exits are two distinct groups of early retirees – who can broadly be categorized by their levels of education (which may in turn reflect lifetime wealth, something that cannot be easily measured in the FES). In one group, typically "high education" individuals retire early, drawing an income from an occupational pension before age 65. The other group of typically "low education" individuals are even more likely to be not working in their 50s, yet do not define themselves as retired and are supported by income support, or more usually, disability benefits.

1.2 What do we mean by retirement?

Any discussion of retirement is complicated by the problem of defining when

retirement occurs, and the prior problem of defining what retirement is. Broadly, the concept of retirement may embody a number of different elements, to differing degrees:[6]

- complete and permanent withdrawal from employment;
- receipt of income from a state or private pension; and
- a state of mind, i.e. the individual perceives themselves to be retired.

A purely subjective definition of retirement has the potential drawback that being retired may mean different things to different people and more importantly to different groups of the population. But, understanding an individual's expectations about their current and future employment status is likely to be important for understanding their life-cycle decisions, i.e. their current and future consumption and savings behaviour. From the perspective of the Life Cycle Model of consumption and leisure, individuals' expectations about their future labour market participation and future income will affect their current consumption behaviour, and individuals' preferences for future consumption will affect their desired future labour market participation. The next chapter explores retirement expectations in more detail.

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[6] For further discussion of what retirement is, see Fields and Mitchell (1984), Lazear (1986) and Lumsdaine and Mitchell (1999)

Economic models of retirement – such as that underlying the analysis of the effect of pension incentives in chapters 4 and 5 – often make a number of simplifying assumptions about the nature of retirement:[7]

- Retirement is usually synonymous with drawing a pension. In some countries, the presence of an earnings test prevents people from working and drawing a state pension, but this was abolished in the UK in 1989 (see chapter 6). However, until recently, people in the UK have not been able to receive an occupational defined benefit pension from an employer they are still working for.

- Retirement is usually a sudden, rather than a gradual, process and encompasses the decision whether to work at all, rather than the decision of how many hours to work.

- Retirement is usually an absorbing (ie permanent) state.

- Retirement is usually an individual decision rather than one made jointly with other household members.

- Retirement is usually a voluntary choice, albeit made subject to opportunities and constraints presented by employers and pension

[7] Of course, there are exceptions, including Rust and Phelan (1997) who model the labour force participation separately from the decision to draw a pension, Berkovec and Stern (1991) who allow retirement to be gradual and Gustman and Steinmeier (2004) who model joint retirement decisions. See Lumsdaine and Mitchell (1999) for a review.

arrangements, and individuals are typically assumed to engage in forward-looking planning in determining the optimal time at which to retire.

This section uses data from the British Household Panel Survey[8] to examine the extent to which the reality of retirement conforms to the stylized version of the models; the next chapter uses data on retirement expectations to examine in more detail the extent to which individuals appear to engage in forward-looking retirement planning. Mainly, the analysis focuses on male retirement behaviour. This is not because female retirement is not an important and interesting subject, but typically looser labour market attachment and the fact that many women do not have a pension in their own right, make it potentially more complicated to analyse female retirement, and the effect of financial incentives on the retirement decision.

In practice, there are multiple pathways to retirement. Some people consider themselves to be retired, but are still working, others have left work never to return, but do not yet consider themselves retired; some people are drawing a pension but still working, while others are retired, but yet to draw a pension. Yet, in spite of this diversity, it is possible to see a dominant pattern of retirement that does indeed to correspond to the stylized version in the economic models. For the majority of men, the three events do coincide – the majority of older men leaving work report that they are retired and start drawing a pension, which, if they retire before age 65, will be an occupational pension from their former employer.

[8] further details are given in the Annex 1.

However, there is also a sizeable minority of typically less-qualified men who are even more likely to be not working in their 50s, yet typically do not define themselves as retired on exit from the labour market and are supported by income support, or more usually, disability benefits. Within both groups, the evidence suggests that leaving work is largely a discrete rather than a gradual process and, for the overwhelming majority, an irreversible one. The evidence does not suggest that a large number of people have been forced to retire early through mandatory early retirement ages (only abolished in the UK in October 2006). But, health factors do appear to play a role in causing "involuntary" early retirements.

When do people retire?

Whichever definition of retirement is used - exit from employment, drawing a pension, or self-assessed retirement status – the majority of men, and many women, do it before the state pension age of 65 for men and 60 for women (Table 1.1). These are the most common single retirement ages for men and women, but 66% of men and 55% of women stop working before this age, 62% of men consider themselves to be retired before they reach 65, and 65% of men have started drawing a pension by then.

Table 1.1

Average retirement ages

	Men		Women	
	Median	Mode (% retiring at that age)	Median	Mode (% retiring at that age)
Age of retirement	62	65 (20.3%)	60	60 (16.9%)
Age of stopping work	61	65 (13.0%)	58	60 (10.2%)
Age of drawing pension	61	65 (27.5%)	60	60 (43.3%)

Source: British Household Panel Survey, 1991-2003

For just over half of men and one-third of women, the three retirement ages coincide: The age at which they stop working is the same as the age at which they start drawing a pension and the age at which they consider themselves to be retired. In other cases, people stop working before they retire, moving into retirement via another non-working state; they also retire before they start to draw a pension, using other early retirement vehicles, particularly disability benefits.

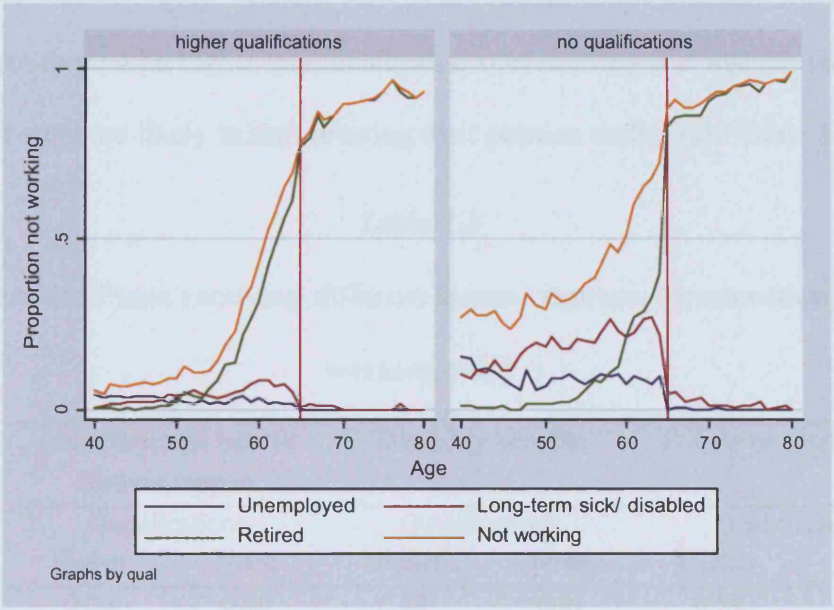
Is retirement synonymous with labour market exit?

While the majority of men retire from employment, around 40% of men move into self-assessed retirement from another non-working state, usually unemployment or long-term sick/disabled. This is particularly the case among those with low levels of qualifications, as shown in Figure 1.8 below. For those with higher qualifications (33% of the sample), leaving employment is much more likely to be synonymous with self-assessed retirement. For those with no qualifications (34% of the sample), levels of non-employment are quite high, even

among people in their 40s. But early retirement is less usual. Instead, those in this group who leave employment are more likely to say that they are unemployed or long-term sick/ disabled. For those with no qualifications, there is a far greater transition to self-assessed retirement at age 65. [9]

Figure 1.8

Employment status among male workers, by education level



Source: British Household Panel Survey, 1991-2003

Is retirement synonymous with drawing a pension?

The majority of men start to draw a pension when they leave work. In the UK, this is typically a private pension – only 7% of men stop working at 65 and draw only a state pension at this age. But, around one-quarter of men stop working

[9] There is a third group with school qualifications whose behaviour is intermediate between the higher and lower education groups.

before they start to draw a state or private pension. Instead, unemployment benefits, income support or, more commonly, disability benefits, form alternative early retirement vehicles. Again, there are interesting differences by education – the better qualified are much more likely to draw on a private pension if they retire before 65, while those with no qualifications are more likely to rely on disability benefits. Although around two-thirds of those with no qualifications do eventually receive some income from a private pension, they are much more likely than those with higher qualifications to start drawing it at age 65; the better-educated are more likely to start drawing their pension earlier (see Table 1.2).

Table 1.2

Proportion of men receiving different income sources, by education (non-working only)

	Unemployment benefit/ Income support		Disability benefits		Private pension income	
	Qualifications		Qualifications		Qualifications	
Age	Higher	None	Higher	None	Higher	None
50-54	0.20	0.40	0.49	0.81	0.54	0.17
55-59	0.09	0.27	0.33	0.72	0.72	0.32
60-64	0.07	0.27	0.28	0.61	0.84	0.51
65-69	0.02	0.10	0.10	0.27	0.90	0.67

Note: Higher qualifications include degree, teaching, nursing or other higher qualification

Source: British Household Panel Survey, 1991-2003

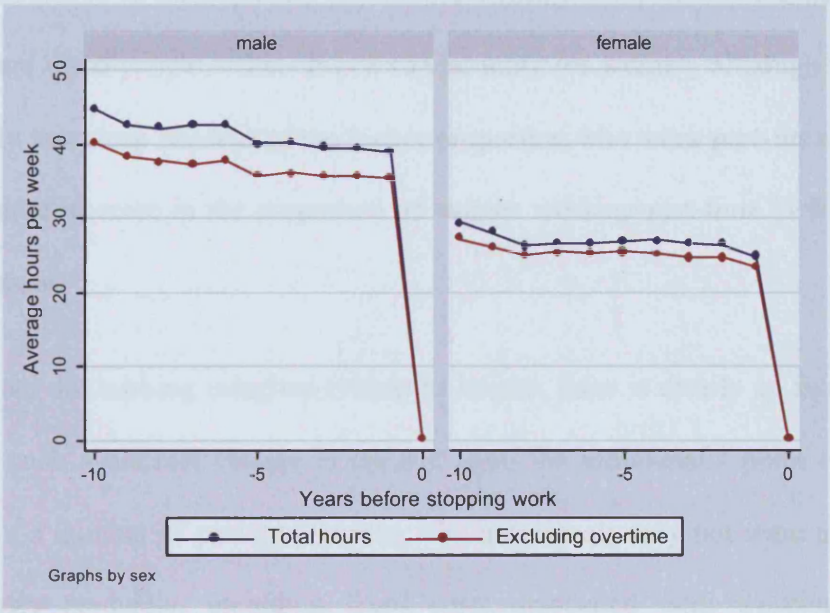
Is retirement gradual?

The evidence suggests that, for the great majority of people, retirement is not a gradual process of labour market withdrawal, but instead involves a fairly abrupt transition from full-time employment to zero hours. In the run-up to retirement, the proportion of men working part-time doubles (this increase is fairly

concentrated between five – seven years from stopping work), but part-time workers still comprise no more than 10% of the total.[10]

Figure 1.9

Average weekly hours prior to retirement



Source: British Household Panel Survey, 1991-2003

The cliff-edge nature of retirement is evident from Figure 1.9, which shows average hours worked per week, with and without overtime, in the run up to retirement.[11] Over the decade before retirement, there is a seven-hour drop in

[10] This evidence appears to be in contrast to the experience in the US where Ruhm (1990) suggests that partial retirement is common.

[11] Note that this is not a balanced panel – the sample observed ten years before retirement is not the same as the sample observed nine years before retirement, and so on.

average total weekly hours worked by men. A fall of around two hours is attributable to a reduction in overtime hours worked; around three hours is due to the increase in part-time work; while, among those who work full-time, the number of hours worked (excluding overtime) falls by a further two hours. But, this slight fall in average weekly hours is as nothing compared to the huge drop that occurs when people retire. It is a similar story for women, although the drop is slightly less steep because of the higher proportion who work part-time. There is very little increase in the proportion of women working part-time in the run-up to retirement.

If there are diminishing marginal returns to leisure, there is clearly an issue about whether such a discrete change is optimal from the individual's point of view. There are a number of possible reasons why individuals may not want to reduce their hours gradually, including fixed costs associated with working and/or economies of scale in converting time into utility-producing leisure. They may also face constraints in their choice of the number of hours to work as a result of the fixed costs of employment to the employer – although the higher proportion of women who work part-time suggests that more men could work part-time if they wanted to, although possibly not in the same job or for the same employer.

Occupational pensions may also affect the gradual/ discrete nature of retirement. Because pension typically depends on final salary, there is a penalty for reducing the number of hours worked in the run-up to drawing your pension, at least if you want to stay in the same job. In fact, the incentive is to increase the number of hours worked in the run up to retirement in order to achieve the highest possible final salary. Also, until April 2006, there was a legal constraint on someone

drawing a pension and continuing to work for the same employer, a further barrier to partial retirement. In the BHPS data, those who *currently* belong to an employer's pension are less likely to shift into part-time work (for the reasons outlined above), but those who have a pension from a previous employer are actually three times *more* likely to work part-time before retirement than those who have never belonged to an employer's pension scheme. This suggests that earlier pension ages in employer pensions may actually facilitate part-time work, by providing an income to supplement earnings from part-time employment, compared to people who rely on the state pension. Those with no private pension income or other financial wealth are likely to be more constrained in their ability to work part-time before the state pension age since other (non-private) early retirement vehicles, income support and disability benefit, do not allow people to combine part-time work with drawing an income.[12]

Is retirement permanent?

The evidence suggests that for most people, retirement is an absorbing state. Looking at the four waves after someone first retires (according to their self-assessed retirement status), 11% of men and 7% of women return to work at some

[12] The over-50s earnings tax credit, introduced in 2003, does provide in-work benefits to anyone working 16 hours a week or more, but is only available to those who have been out of work for more than 6 months.

time during this period. This means that more than 90% of people who retire, appear to stay retired.[13]

Is retirement an individual or household decision?

Retirement has most commonly been analysed as an individual rather than a joint household decision (for exceptions see Hurd, 1990, and Gustman and Steinmeier, 2004) although this is mainly for reasons of analytic and computational simplicity. There are several reasons for thinking that retirement might be determined jointly, however, including: complementarity of leisure, correlated preferences, caring responsibilities in the presence of health shocks, or common income/wealth effects. However, evidence from the BHPS suggests that the simultaneous retirement of husbands and wives is relatively uncommon.[14] In the BHPS sample, for example, around 10% of people stop working at the same time as their partner, and a further 10% retire one year before/ after their partner. Looking at the reasons for retiring early (see Table 1.3 below), only 3% say that it was in order to retire at the same time as their partner, although 7% retired early because of other's ill-health and 8% retired early to spend more time with their family, suggesting that consideration may be given not just to leisure time or caring responsibilities with respect to a partner, but also children, grandchildren and possibly parents. These factors are much more important for women than for

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[13] Again, the US experience appears somewhat different to this. Ruhm (1990) suggests that 25% of people who retire re-enter the labour force.

[14] Although, of course, retirement decisions may be made jointly even if retirements are not simultaneous.

men[15] – accounting for 30% of early retirements for women compared with 7% for men.

Is retirement a voluntary choice? Mandatory retirement and ill-health

Economic models typically treat retirement as a choice variable, albeit a choice that is made subject to the potential constraints of employment opportunities and pension arrangements. However, there is a range of factors that may force people into early retirement.

One of these is mandatory early retirement ages, only abolished in the UK from October 2006 following a European Commission Directive.[16] Evidence from the US shows that there, the abolition of mandatory retirement ages raised employment among older workers – Neumark and Stock (1999), for example, found that abolition raised employment rates among affected older workers by as much as seven percentage points. However, limited evidence in the UK, suggests that the effect of abolishing early retirement ages is likely to be quite small. As shown in chapter 6, the 1989 abolition of the earnings test – which operated as a restriction on the employment of older workers – had only a small effect on the employment of older workers. One possible reason is that employment rates among older workers are typically lower than they were in the US when

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[15] This is consistent with evidence from the US showing that women's retirement is affected by their husbands' pension arrangements, but that the same is not true for men (see Coile, 2004).

[16] Mandatory retirement before the state pension age has been abolished, but firms can still impose retirement ages of 65 and above (for men) and 60 and above (for women)

mandatory retirement was abolished. The available evidence suggests that there are relatively few people who feel constrained by mandatory early retirement ages. Around one-third of the BHPS sample say that they feel that retirement was something that they were forced into, rather than being voluntary, but mandatory early retirement ages do not appear to be the main factor behind forced retirements. Around half the BHPS sample (60% of men) report that they have a fixed retirement age in their job,[17] although for most men this age is 65 or greater and so will not be affected in October 2006. Only around 1.5% of retirements appear to be attributable to mandatory retirement ages below 65. [18]

Ill-health appears to play a potentially greater role than mandatory early retirement in explaining why people feel forced into retirement. Table 1.3 shows that, overall, around one-quarter of the sample gave ill-health as the main reason for early retirement; when early retirement was forced, this proportion rose to over half. These numbers are very similar numbers to those found using more recent data from the English Longitudinal Study of Ageing data (see Banks and Casanova (2004) who instead distinguish the analysis by whether individuals retired before or at/after the state pension age).

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[17] These figures are also likely to overstate the extent to which there are mandatory retirement ages since people may just be referring to normal retirement ages in their occupational pension schemes.

[18] This evidence is in line with Meadows (2003) who also found a limited number of cases where early retirement could be directly attributable to mandatory early retirement.

Table 1.3

Main reason for early retirement, according to whether retirement was wanted or forced

	Men			Women		
	All	Wanted	Forced	All	Wanted	Forced
Own ill-health	28.8%	9.2%	56.3%	24.8%	11.4%	45.5%
Others' ill-health	4.1%	2.3%	3.8%	10.2%	5.1%	17.6%
Redundancy/ compulsory	19.1%	10.0%	28.2%	12.1%	5.9%	20.6%
Financial deal	25.3%	42.3%	4.7%	7.3%	11.8%	1.2%
Spend more time with family	3.4%	5.8%	0.0%	13.2%	21.7%	1.8%
Enjoy life while young & fit	8.7%	16.5%	0.5%	9.7%	16.1%	1.8%
Same time as partner	0.2%	0.0%	0.5%	6.7%	11.0%	1.2%
Other	10.4%	13.9%	6.0%	16.0%	17.1%	10.3%

Source: British Household Panel Survey, 2001

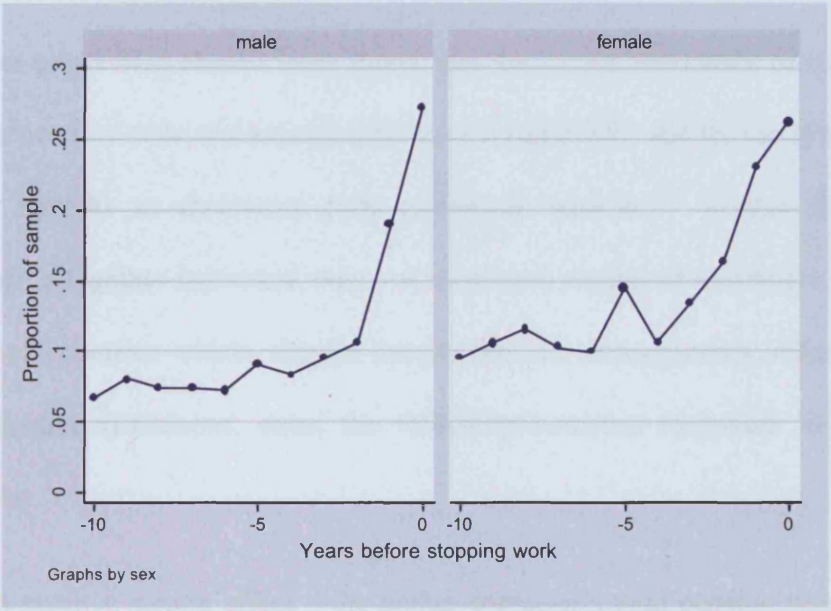
Of course, there are a number of problems with these subjective data on reasons for retirement – there may be a degree of post-hoc rationalisation and reported ill-health may be linked to receipt of disability and other ill-health benefits. Nevertheless, other evidence supports a link between ill-health and retirement. Figure 1.10 below shows that the proportion of people reporting that their health limits their daily activities[19] increases sharply in the years immediately before

[19] This variable is not present in wave 9 of the BHPS, but a value can be imputed on the basis of individuals' responses in waves 8 and 10. For individuals who report the same values in wave 8 and 10 this is fairly straightforward. Where there is a change between waves 8 and 10, the individual is assigned the value in wave 10 (where available), and otherwise the value in wave 8.

people are observed stopping work. Interestingly, there is a slight increase in the proportion reporting problems with their health five years before stopping work, which coincides with the biggest reduction in average weekly hours and the increase in the proportion of people working part-time.

Figure 1.10

Proportion reporting that health limits daily activities



Source: British Household Panel Survey, 1991-2003

The analysis of retirement expectations in the next chapter shows that differences between actual and expected retirement ages (people retiring earlier than they expected) are linked to changes in (self-reported health status), although, again, there is a potential problem of post-hoc rationalisation. In a more robust specification using data from the British Household Panel Survey, Disney et al

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It makes no difference to the results if, instead, the individual is assigned the value in wave 8 where available and wave 10 otherwise

(2006) instrument the (endogenous and noisy) self-reported health variable by a constructed 'health stock' measure using a set of health indicator variables and personal characteristics. They show that adverse individual shocks to health stocks are a significant predictor of individual retirement behaviour among workers aged 50 and over.

1.3 Pensions and retirement

A number of previous studies have shown that the timing and nature of retirement are influenced by state and private pension arrangements, and by the availability of other benefits as alternative early retirement vehicles.[20] Gruber and Wise (2004) bring together individual micro-econometric studies of retirement across a number of countries which, despite unique pension arrangements, cultures and labour market institutions, share the following common responses to pension incentives:

- A positive wealth effect – the higher someone's total pension wealth (and other financial wealth), the more likely they are to retire;
- A negative accrual effect – the more that someone can increase their total pension wealth by delaying their retirement, the less likely they are to retire;
- The independent effect of eligibility ages – while pension accrual typically turns negative after someone becomes eligible for a pension, providing an

[20] See for example, Fields and Mitchell (1984), Stock and Wise (1990), Samwick (1998)

> incentive to retire, a common finding across a number of countries studies is that the pure economic incentive effects cannot explain the observed levels of retirement at these ages. One explanation is that eligibility ages may act as social norms, with people viewing them as appropriate or acceptable retirement ages. Another possible explanation is that people may be liquidity constrained and unable to retire before they become eligible to receive pension income, even if it is "optimal" for them to retire earlier.[21]

These effects are explored further in chapters 4 and 5. The UK is an interesting case to look at in analysing the relationship between pensions and retirement for a number of reasons (see Box 1.1 for an overview of the UK state pension system).

Reforms to the state pension system, (such as the introduction of SERPS in 1978) give rise to some variation in pension wealth across recent cohorts of retirees, which can be used to identify the effect of pension incentives on the timing of retirement. However, most men in recent and current cohorts of retirees have opted out of the earnings-related pension. For them, the state pension is a fairly minimal, flat rate pension and the main retirement incentives are to be found in their private pensions.

Compared to most other OECD countries, the UK has a high level of private pension provision. Among recent and current cohorts of retirees, the most important private pensions have been employer-provided, defined benefit (DB)

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[21] People cannot typically borrow against future state pension income.

occupational pensions. As shown in Figure 1.11, membership of these schemes among grew rapidly in the 1950s and 1960s, but has been in gradual decline since the early 1980s. Among men, membership doubled in the 1950s and 1960s, reaching 10 million in 1967. By 2004, male membership had fallen back to less than 5 million. Among women, by contrast, membership has steadily been increasing over the whole period – from just over one million female members in 1953 to 5 million members in 2004. There are now more women than men belonging to an employer's pension scheme. This trend reflects changing female employment (more women working full-time and in the public sector), but also regulations requiring employers to provide pensions to part-time workers.

Box 1.1 An overview of pensions in the UK

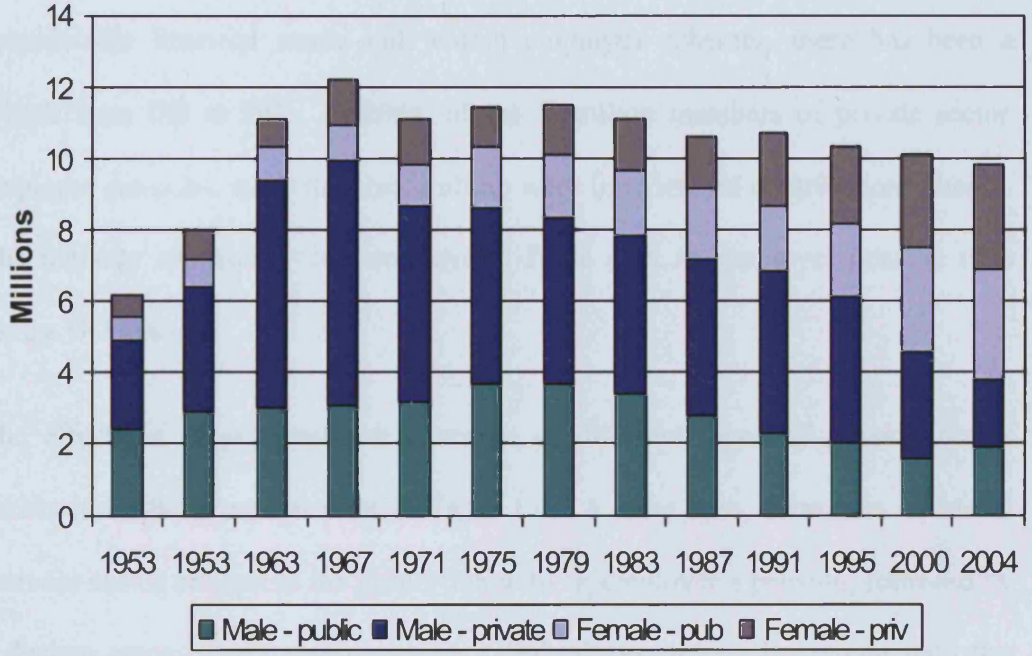
The **first tier** of the pension system is the Basic State Pension, largely unreformed since it was introduced in 1948. It is a flat rate, contributory benefit payable to men from the age of 65 and to women from the age of 60, funded on a pay-as-you-go basis. Since 1989 it has been paid regardless of whether individuals have actually retired or not. Since the early 1980s, the basic state pension has been uprated annually in line with inflation and its value has fallen relative to earnings. It is currently less than the level of means-tested benefits available for those aged 60+, and in practice, these benefits also form part of the first tier of pension provision for those with no (or little) additional pension income. Until 1978, married women could choose to opt out of the basic state pension (and receive only an addition to their husband's pension) in return for reduced national insurance contributions. Only a minority of women retiring today qualify for a basic state pension in their own right.

Since 1978, individuals have also been compelled to contribute to a **second tier** of pension provision, but have a significant amount of choice over the way in which they save within this tier. The default is membership of the state scheme (formerly the state earnings-related pension scheme (SERPS), now the state second pension (S2P)), but individuals can choose to 'opt out' into a private pension. When it was introduced, SERPS was intended to pay a pension worth one-quarter of an individual's best twenty years' earnings (up to a specified upper earnings limit) but its value has gradually been reduced and in the medium term, S2P will become a flat-rate top-up to the basic state pension. Between 1978 and 1988 individuals could opt out of SERPS into a defined benefit (final salary) scheme that guaranteed to pay at least as generous a pension as the state alternative. But, from 1988 onwards individuals could also opt out into a defined contribution (money purchase) pension scheme. Since this time, there has been a growth in defined contribution occupational pension schemes and in individual retirement accounts, known in the UK as personal pensions or, since 2001, stakeholder pensions.[22]

[22] A stakeholder pension is a personal pension with an annual charge cap and no limits on minimum contributions. See Chung et al (2004) for further discussion.

Figure 1.11

Active members of employer pension schemes, by sex



Source: Government Actuary's Department

Since 1988, there has been a shift within private pension coverage from defined benefit (DB) to defined contribution (DC) schemes. This trend is linked to a number of different factors. Most importantly, in 1988, the government extended contracting out of the second tier of the state pension to individual and employer DC plans (as well as DB plans), motivated by a desire to promote greater labour market flexibility (see Disney et al, 2004, for further discussion). Roughly 25% of the workforce chose to purchase personal pensions over the period 1988 – 92, although more recent figures suggest there has been a decline in membership since then with the 2002 General Household Survey showing 19% of full-time

male employees and 12% of female employees with a personal pension. More recently, many employer DB schemes have closed to new (and, less commonly, existing) members after the combination of increasing life expectancy, an increasing burden of regulation and low equity returns put them under considerable financial strain and, within employer schemes, there has been a switch from DB to DC. In 2004, of the 5 million members of private sector employer pensions, more than one million were in a defined contribution scheme. The majority of small (<100 employees) firms with an employer pension now have a DC scheme.

The effects of these trends on coverage of different types of pension across successive cohorts can be seen in Table 1.4. Among men, there was an initial increase across cohorts in the proportion with an employer's pension, followed by a decline among more recent cohorts (1940-49 onwards). Beginning with the 1930-39 cohort, there has been a substantial increase in the proportion who have an individual defined contribution scheme. Among women, there has been a steady increase in coverage of both employer and individual pensions, reflecting changing female employment and increased pension coverage among part-time workers.

Table 1.4

Private pension coverage, by cohort

	Employer's pension only	Employer's pension and personal pension	Personal pension only	Neither
Men				
1910-19	57.5%	9.3%	5.7%	27.5%
1920-29	61.6%	9.7%	4.9%	23.8%
1930-39	46.4%	22.7%	9.8%	21.2%
1940-49	35.7%	25.7%	17.7%	21.0%
1950-59	31.7%	27.0%	19.8%	21.5%
1960-69	30.3%	28.0%	19.2%	22.6%
Women				
1910-19	22.2%	2.3%	4.7%	70.8%
1920-29	29.6%	4.2%	4.0%	62.2%
1930-39	32.0%	10.3%	6.6%	51.1%
1940-49	27.5%	16.5%	10.7%	45.4%
1950-59	30.3%	20.4%	10.9%	38.5%
1960-69	34.4%	18.8%	8.6%	38.3%

Note: Employer pension defined by whether someone is currently a member of their employer's pension scheme and/or is receiving a pension from a former employer. Personal pension is defined by whether someone is contributing to a personal pension and/or is receiving a private pension or annuity.[23]

Source: British Household Panel Survey, 1991-2003

[23] In most cases, the employer's pension will be a DB occupational pension scheme, but some (particularly younger) workers, may have an employer DC pension or even a Group Personal Pension (a collection of individual DC private pensions organised at the employer level). The fairly high proportion who are observed to have both will include some people who, at some time, have been in an employer's pension and a personal pension, some people who belong to a GPP and some people who make free standing additional voluntary contributions to their occupational pension.

The changing patterns of pension coverage are likely to have important effects on retirement behaviour. These are discussed in detail in chapters 4 and 5, but broadly, they include the following impacts.

- The widespread coverage of occupational pensions is likely to explain at least part of the trend towards earlier retirement. Not only did increased coverage of occupational pensions act as a positive wealth effect, but in the late 1980s and early 1990s, employers could use generous early retirement windows, funded by pension surpluses, to downsize workforces during a period of industrial restructuring (see Disney, 1999).

- DB plans typically provide individuals with strong incentives to leave work at normal, or early, retirement ages. Normal retirement ages in employer pensions are typically before the state pension age, and most schemes have some provision for early retirement. As previously discussed, employer provided pensions may also have acted as a constraint on flexible retirement, since people could not work for an employer and receive a pension at the same time.

- The shift to DC schemes is likely to bring changes to retirement behaviour. There are less clear incentives to retire at particular ages and potentially greater flexibility over the timing and nature of retirement. Recent estimates suggest that levels of wealth in defined contribution pensions are typically lower than in most defined benefit employer schemes, which would tend to lead to later retirement. Moreover, the associated risks and flexibility of these schemes is quite different to that of DB schemes, as

explored further in chapter 5.

1.4 Conclusions

This chapter has highlighted a number of features of retirement in the UK that will be picked up by the analysis in later chapters.

- The pattern of retirement for men today is very different to that of 30 years ago. Most men now leave work before the state pension age and the median age for employment exit has fallen from 65 to 60. Far fewer people work beyond the state pension age, in spite of the abolition of the earnings test in the state pension in 1989. Much of this pattern is likely to arise from incentives faced by individuals in their employer, defined benefit pension schemes. Chapter 4 explores the role of pension incentives in more detail and chapter 5 considers the implications for retirement of the ongoing shift from defined benefit to defined contribution plans. Chapter 6 looks at whether the abolition of the earnings test had an effect on the employment of affected older workers.

- While there are multiple pathways to retirement, there is a dominant model that conforms to the stylized model of retirement underlying many economic models. The majority of men appear to take voluntary, early retirement onto a pension income, typically from a previous employer. Retirement is usually discrete and permanent.

- However, there is a sizeable minority of, typically less well-qualified individuals, who enter retirement via another non-working state and are

more likely to receive unemployment or disability benefits, rather than a pension. This thesis does not directly explore the links between health and retirement. Chapter 2 compares retirement expectations with realisations and looks at what might explain why people retire earlier/ or later than they expected. Chapter 3 compares what happens to a measure of spending at retirement when retirement appears to be involuntary rather than voluntary.

Annex 1: Data from the British Household Panel Survey

The data used to analyze retirements in this chapter are taken from waves 1-13 of the British Household Panel Survey. This panel dataset has been collecting information on the same sample of approximately 10,000 individuals each year since 1991. The analysis uses a selected sub-sample of men and women aged 40 – 80 in each wave. Since the BHPS covers all ages, it has a smaller number of individuals in the relevant age range for studying retirement than, for example, the US Health and Retirement Survey and the new English Longitudinal Survey of Ageing (ELSA). Nevertheless, there is a reasonable-sized sample of around 1,500 retirements over the entire period and a wide number of variables, including some summary information on spending, well-being and health as well as the detailed income information in each wave. One of the main strengths of the BHPS is that, with up to thirteen waves of information on each individual, it affords quite detailed analysis of dynamics of retirement transitions. Moreover, in wave 11, a special module collected information on ageing and retirement that was designed to be directly comparable with the questions collected in the more specialist ELSA questionnaire.

The definitions of "retirement" exploit the panel aspect of the BHPS data as follows:

- **Self-assessed retirement** is defined as the first time someone reports that their employment status is retired. In the BHPS someone cannot be simultaneously working and retired since these are mutually exclusive categories. In other British retirement surveys, such as the UK Retirement

Survey (see Tanner, 1998) and ELSA (see Banks and Casanova, 2004) retirement status is asked independently of employment status, so that someone can be retired and working.

- **Stopping work** is defined as the last time that someone is observed to leave employment. Clearly, this definition potentially suffers from the fact that the data are right-censored.

- **Pension receipt** is defined as the first period in which someone is observed to receive an income from a pension (from a former employer, a private pension/ annuity, an NI pension, or a widow's pension).

Chapter 2: What can we learn from expectations data?

This chapter addresses two main questions:

- To what extent do the reported retirement expectations of a cohort of individuals approaching retirement suggest that individuals are engaging in forward-looking planning behaviour with regard to their retirement, such as is implied by, for example, the life-cycle model of consumption and saving and the option value model of retirement (see, for example, Stock and Wise, 1990).

- How do expectations and realizations of retirement compare, and is there evidence of particular shocks that cause expectations and outcomes to diverge?

The data are taken from the UK Retirement Survey. This survey sampled a group of households in the UK that contained at least one individual aged between 55 and 69 in a period covering late 1988 and 1989.[24] Surviving individuals who

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24 For further details on sampling procedures and some cross-tabulations from the first wave of the sample, see Bone *et al* (1992). On retirement behaviour, using the first wave of the Retirement Survey, see Disney et al (1994).

could be followed-up were re-interviewed in 1994.[25] The availability of two waves of data from the Retirement Survey enable a matching of individuals' prior expectations of their retirement age, collected in the first wave, with their subsequent behaviour, observed by the second wave. Similar studies have been carried out in the US (see Bernheim, 1989, and Hurd, 1996).

At first sight, the data on retirement expectations do not appear to be promising. The distribution of reported expected retirement ages is dominated by spikes at the state pension ages (60 for women and 65 for men) and is much more heavily concentrated than the distribution of actual retirement ages. Also, even among a cohort close to retirement, a high proportion reports that they don't know when they expect to retire.

However, much of this may reflect the nature of the data and, in particular, the fact that individuals are asked to give single point expectations. Individuals are likely to face uncertainty over their retirement age, which will depend on a number of (unknown) variables such as future earnings and health. Their expectation of when they are going to retire may therefore be a range of possible ages, together with assigned probabilities, each of which represents the solution to the optimal retirement problem in a different state of the world. Being asked to report a single point expectation then requires them to collapse this subjective probability distribution to a single measure. In this case, Bernheim (1989) argues, there is no reason for individuals to report the mathematical *expectation* rather

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25 See Disney et al (1998)

than some other measure such as the mode or the median of the underlying distribution.

Among the implications of this are that:

- The distribution of reported ages will be more concentrated than the distribution of actual ages. Looking at Dutch income expectations, for example, Das (1996) finds that the dispersion in expected income changes is smaller than the dispersion in actual income changes.

- Even if more people retire earlier than they reported that they expected to than later than they reported that they expected to, expectations may be rational.

Considerable attention in empirical studies using expectations data has focused on whether individuals appear to form 'rational' expectations (see Wolpin and Gonul, 1985, Bernheim, 1989, and Das and van Soest, 1997). By rational is meant that individuals' expectations equate to the best prediction of future outcomes taking advantage of all currently available information. A testable implication of the rational expectations hypothesis is that, in the absence of common macro-shocks, the distribution of observed retirement outcomes should correspond to individuals' *subjective probability distribution.* With point expectations data, this hypothesis cannot be tested directly. And, with only two waves of data, it is not possible to rule out common shocks.

The plan of the chapter is as follows. The next section discusses in further detail some of the issues in analyzing and interpreting point expectations data. Section

2.2 describes the Retirement Survey and the retirement expectations data. Section 2.3 looks at what individuals appear to be reporting with single point expectations and with don't know responses. Section 2.4 compares reported expectations and outcomes and looks at whether there are identifiable shocks – to health or marital status – which may cause reported expectations and realisations to diverge. Section 2.5 concludes.

2.1 Retirement expectations

The optimal time for an individual to retire is assumed to depend on a vector of observable characteristics, which may include (uncertain) future values of eg wages, a vector of unobservable characteristics and pure unknowns. Individuals are assumed to form a subjective probability distribution over possible future retirement ages (corresponding to different states of the world).

If individuals form rational expectations, their set of retirement expectations (p[r | I(t)]) represents the best prediction of their actual retirement outcomes, given available information. This implies that, for a set of identical individuals, the observed distribution of outcomes will be identical to the subjective probability distribution except for unanticipated shocks.

$$R(t) = p[r \mid I(t)] + \varepsilon$$

where R(t) is the distribution of actual retirement ages and ε is a common macro-shock which is uncorrelated with I(t).

Knowing individuals' subjective probability distribution, this could be tested explicitly. Some surveys ask questions about future events which try to get at

individuals' underlying subjective probability distribution. In the US Health and Retirement Survey, for example, individuals are asked to indicate the chances of various future events, such as retiring at 62 or 65, on a scale of 1 to 10. These can be used to build up probability distributions for expectational variables of this type: see *inter alia* Dominitz and Manski (1997), Hurd and McGarry (1995), Juster and Smith (1997), and Manski (1990).

In the Retirement Survey, however, individuals are asked to report a point expectation, which is assumed to represent a single measure of central tendency from the underlying distribution. One possibility is that individuals adopt a modal response strategy, i.e

$$ER(t) = argmax_r \; p[r \mid I(t)]$$

Where ER(t) is the reported expected age of retirement and p[r | I(t)] is the underlying subjective probability distribution over all possible retirement ages.

With this information, it is not possible to test directly a rational expectations hypothesis. The distribution of outcomes (R(t)) could exactly match the individuals' underlying subjective probability distribution (p[r|I(t)]) without it being the case that the distribution of reported expectations is the same as the distribution of outcomes (and vice versa). A simple illustration illuminates this point. Suppose I (together with the rest of the population) think that the probabilities of retiring at 62, 63, 65 and 66 are respectively 0.1, 0.2, 0.5 and 0.2. When asked to give a single expected age of retirement a possible response is to say 65 since it is the mode and mean (to the nearest whole age) of the underlying probability distribution. In the absence of shocks, 10 per cent of the population

retires at 63, 20 per cent at 64, 50 per cent at 65 and 20 per cent at 66. In this case the observed distribution of actual retirement ages is more dispersed than the distribution of reported expected ages (which is a single spike at 65). Comparing outcomes to reported expectations, half the population would appear not to retire when they expected and more people would appear to retire earlier than expected than retired later than expected whereas in fact the subjective and the objective probability distributions are identical.

However, it would be possible to test a joint hypothesis of rational expectation formation and a modal response strategy:

$$ER(t) = argmax\ R(t) + \varepsilon$$

i.e. the reported expected age of retirement will correspond to the mode of the distribution of outcomes. In the Retirement Survey, however, with only two waves of data, it is not possible to rule out common shocks.

If individuals adopt a modal response strategy there may be circumstances where it is difficult for them to provide a single point expectation, for example, where the underlying probability distribution is bimodal. Or it may be the case that the distribution is insufficiently compact to permit a plausible modal response. In such circumstances, Carlson and Parkin (1975) suggest that individuals may adopt the following 'rule of thumb':

$$Response = ER(t) = argmax_r\ p[r \mid I(t)]\ \ if\ p(argmax_r) \geq 0.5$$

and:

Response = 'don't know' if $p(\text{argmax}_r) < 0.5$

That is, individuals will only provide a response to this question if the point expectation dominates all other possibilities. Otherwise, they give a 'don't know' response. In this case, 'don't know' is not an indicator of a lack of forward-planning behaviour, but an indicator of genuinely greater uncertainty. In principle it should be possible to distinguish between these two if there are reasonable proxies for the ability to form an underlying subjective probability distribution (for example education) and for the compactness of the subjective probability distribution (for example, proximity to retirement).

2.2 Retirement Survey data

The data are taken from the UK Retirement Survey (RS), a household panel survey collected by the Office for Population and Census Surveys on behalf of the Department for Social Security. This was the first large-scale panel data set in the United Kingdom to focus on individuals around the time of retirement;[26] it collected information on a national random sample of individuals born between 1919 and 1933 who were aged 55-69 at the time of the first wave. In this respect, it is similar to the Retirement History Survey (RHS) and the Health and Retirement Survey (HRS) in the US. And, like the two US surveys, the Retirement Survey contains detailed information on individuals' health, wealth, income and retirement behaviour, and a retrospective event history covering family composition and employment. It also contains information on individuals'

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[26] For a good overview of information in the Retirement Survey see Disney et al. (1998).

expectations of retirement. However, it differs from the US surveys in that only two waves of data were collected. The first wave of the survey was conducted between November 1988 and January 1989 and collected information on 3,543 key respondents (who were aged 55-69). The key respondents include spouses if they were in the relevant age range. In addition, information was also collected on 609 spouses outside this age range. About two-thirds of the original sample were re-interviewed in 1994. 11% of respondents disappeared in this interval due to mortality; the residual attrition is a combination of non-response and (perhaps) unreported mortality.[27]

Unlike the two US surveys, however, the Retirement Survey has only two waves. Wave 1, carried out in 1988/89, collected information on 3543 'key respondents' who were then aged 55-69, together with 609 spouses outside this age range, a total of 4152 individuals. Wave 2 was collected in 1994. About two-thirds of the original sample of key respondents and spouses were re-interviewed. 11% of respondents are known to have died in this interval, while the residual attrition is a combination of non-response and (perhaps) unreported mortality.[28]

The analysis is based on a selected sample of individuals in the Retirement Survey. First, we select only those who appear in both waves of the Survey. Since the rates of (non-mortality) attrition between the two waves are not random, the

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[27] The high attrition rate is largely due to the fact that the survey was not originally intended to be a panel survey. Hence, little attempt was made to keep in touch with respondents after the first wave.

sample of survivors is re-weighted to correct for known differential attrition rates by age, socio-economic status and gender.[29] A second selection is that, within the group of survivors, we look only at those who have not yet retired by the first wave of the sample, and who have non-missing information (including don't know responses) on expected age of retirement.

Table 2.1 reports summary statistics for this sub-sample relative to the sample of all wave 2 survivors. Given the selection criteria, it is a relatively small and selected sub-sample of the whole data. There are differences in the observable characteristics (such as gender, age, health and whether or not they have a private pension) and also presumably in unobservable characteristics, such as preferences over work and leisure. Since, for the most part, we compare expectations and outcomes for the same people, the problem of unobserved heterogeneity is not a central issue but we would emphasis that the analysis in this chapter is likely to be indicative only and is not presented as a (reduced form) model of retirement for the general population.

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28 The Retirement Survey was not originally intended to be a panel and insufficient care was paid to keeping in touch with Wave 1 respondents to ensure high response in the second wave.

29 A detailed description of the grossing factors used to re-weight the sample is given in the Appendix to Disney et al (1998)

Table 2.1

Summary sample statistics

	Whole sample	Sub-sample
Average age in Wave 1	61.7	58.6
Proportion who are female	54.4%	38.2%
Proportion with no educational qualifications	57.0%	52.0%
Proportion who are married in Wave 1	74.9%	79.4%
Proportion who are divorced/ widowed in Wave 1	18.3%	12.9%
Average severity score	0.86	0.41
Proportion who are working full-time in W1	24.2%	66.6%
Proportion who are working part-time in W1	13.1%	26.2%
Proportion who are self-employed in W1	9.4%	14.5%
Proportion with an occupational pension	47.0%	55.2%
No. of observations	2488	764

Source: Retirement Survey

Severity scores are measures of self-assessed health status. They are based on the international classification of impairments, disabilities and handicaps (ICDIH). Separate scales are constructed for areas of locomotion, reaching and stretching, dexterity, seeing, hearing, continence, communication, personal care, behaviour, intellectual functioning, consciousness, digestion and disfigurement. The severity score is constructed as a weighted average of the three highest severity scores from the 13 areas: Highest + 0.4(second highest) + 0.3(third highest).

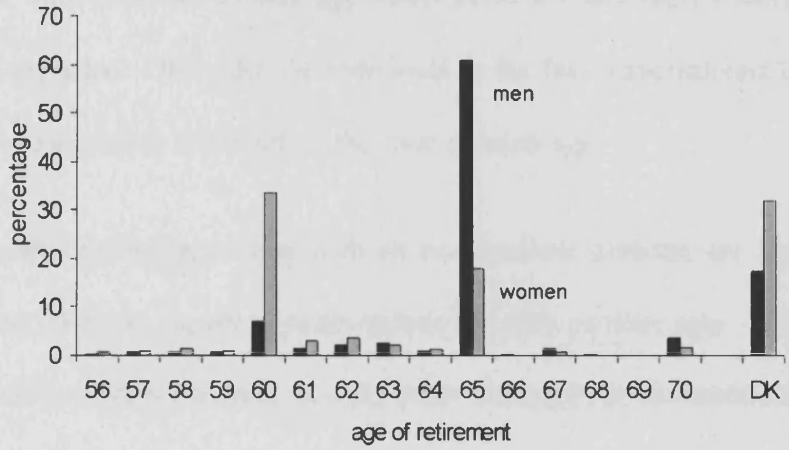
The definition of retirement used throughout this chapter is a purely subjective one. The age of retirement is the age at which individuals report that they retired.

As the previous chapter showed, subjective retirement may differ from an objective measure of permanent exit from the labour market. Objective measures are sometime preferred to avoid the problem of what subjectively-defined retirement actually means. However, since this chapter will be concerned with comparing individuals' expectations and realisations of retirement, this issue should matter les. The main thing is that people refer to expectations and realisations of the same event in their minds, however defined.

All people in the first wave of the Retirement Survey who have not retired are asked '*at what age do you expect to retire?*' The distributions of reported expected retirement ages for men and women are plotted in Figure 2.1 (including the proportions of men and women who say that they do not know when they expect to retire). The distribution for men is dominated by a 'spike' at 65, the age at which men first become eligible to receive the state pension, with more than 60% of men saying that they expect to retire at this age. Around one-third of women say that they expect to retire at 60 (the state pension age for women), although nearly the same number say that they do not know when they expect to retire.

Figure 2.1

Distribution of expected retirement ages



Source: Retirement Survey

The dominance of the distribution by spikes at the state pension ages and the high proportion of 'don't knows' at first sight suggests that little interesting information is provided by these responses.[30] But, the responses are not simply random. A first (albeit obvious) difference is that, on average, women expect to retire at earlier ages than men. In addition, regression analysis shows that other observable characteristics, which are known to be correlated with retirement ages, co-vary with retirement expectations in the same way. This is explored by means of an ordered probit regression of a dependent variable that takes the value 1, 2 or

30 Keane and Runkle (1990) suggest that individuals have no incentive to respond truthfully or honestly to expectations questions.

3 depending on whether the individual expects to retire before, at or after the state pension age. The full results are reported in the Appendix (Table A2.1). The main findings are:

- For both men and women age enters positively and significantly as might be expected – the older the individual at the first wave the less likely they are to expect to retire before the state pension age.

- Conditional on age, men with an occupational pension are significantly more likely to expect to retire before the state pension age. This is likely to reflect typical normal or early retirement ages in occupational pensions before age 65 (see chapter 4).

- Men who have spent more than 95 per cent of their working lives since age 25 in full-time employment are also more likely to expect to retire before the state pension age. This may reflect the fact that they have built up a greater level of pension wealth in a state or private pension.

- Men and women currently in part-time employment are significantly more likely to expect to retire after the state pension age. In the case of men this group is likely to comprise those who have left their main lifetime employment and returned to work part-time.

- Poor health, measured by the severity score at wave 1, has a positive effect on the probability of expecting to retire before the state pension age, which is significant in the case of women.

Moreover, individuals' reported expectations also have predictive power for

retirement behaviour beyond their correlation with observables. Most likely this is because they reflect unobservable characteristics (such as preferences for work and leisure). For individuals who had retired by the second wave, we run a simple OLS regression of the actual age of retirement on a set of economic and demographic variables known at wave 1 and include individuals' expected age of retirement as an additional explanatory variable to see if it has predictive power for individuals' actual age of retirement. The coefficient on expected retirement age (summarised in Table 2.2) is positive and significant for both men and women, suggesting that expectations information, if available, does have a role to play in modelling actual retirement behaviour.

Table 2.2

Predictive power of expectations for actual age of retirement

Dependent variable: Age of retirement (if known at wave 2)

	Men		Women	
	Coeff	SE	Coeff	SE
Expected retirement age	.3421	.0467*	.3015	.0629*
No. observations	245		150	

Control variables: Age, income, education, marital status, severity score, occupational pension, whether saved for retirement, employment status in wave 1, employment history

* denotes significant at 5% level

Source: Retirement Survey

2.3 Interpreting point expectations and "don't knows"

So, point expectations do appear to have some informative content, but how do they relate to individuals' underlying subjective probability distribution? Figure 2.2 plots the distributions of actual retirement ages for each expected age of retirement between 60 and 65 (for men and women together to increase sample size). It shows a positive monotonic relationship between expected age of retirement and the bulk of the distribution of actual ages of retirement with most people retiring when (or close to when) they said they expected to retire at each given expected age of retirement. This supports the idea that point expectations represent a measure of central tendency.

Figure 2.2

Distribution of actual retirement ages, by reported expected age

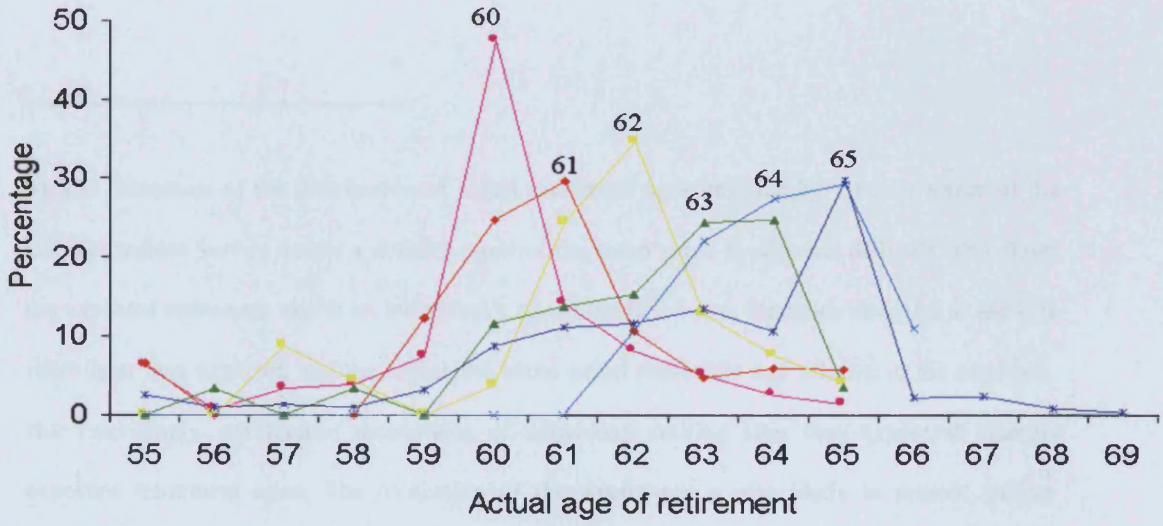


Table 2.3 considers the relationship between expected retirement age and the mean, mode and median of actual retirement ages.[31] Within the age range 60-65, reported expectations appear reasonably consistent with all three measures, although none is a perfect match. A simple performance measure, $\sum_{i=1}^{N}\left|ER_i - \hat{R}_i\right|$, where ER_i is the individual's expected retirement age and $\hat{R}_i$ is the measure of central tendency, shows that the data support a mode or median response strategy rather than a mean response strategy. This result is consistent with Bernheim's finding for the US that individuals' reported expectations do not appear to correspond to a mathematical 'expectation', but some other measure of central tendency.

31 The truncation of the distribution of actual retirement ages imposed by the two waves of the UK Retirement Survey makes a definitive test of the mean value hypotheses difficult. The closer the expected retirement age to an individual's age at the first wave, the more likely he or she is to retire later than expected and the higher the mean actual retirement age relative to the expected. Not surprisingly, the highest proportions of individuals retiring after they expect at younger expected retirement ages. The truncation of the dstribution is also likely to present similar problems in testing the modal value hypothesis, although less so if individuals have a compact probability distribution.

Table 2.3

What do people report: mean, median or mode?

		Average of actual retirement ages					
Expected			Men			Women	
Age	N	Mean	Mode	Median	Mean	Mode	Median
60	106	60	60	60	60	60	60
61	13	62	60	60.5	62	61	61
62	17	62	62	62	62	62	62
63	18	63	63	63	63	64	63
64	10	64	64	64	65	65	64.5
65	199	64	65	65	64	65	65
$\sum_{i=1}^{N}\left\|ER_i - \hat{R}_i\right\|$		191	27	7	52	33	15
No. obs		235	235	235	148	148	148

Source: Retirement Survey

A sizeable number of people in the sample say that they do not know when they expect to retire. Some previous studies of retirement expectations, such as Bernheim (1989), have dropped 'don't know' responses from the sample. But, rather than being a lazy or uninformed response, a 'don't know' may be a rational response where people face greater uncertainty over their future labour market behaviour. Looking in more detail at the characteristics of the don't knows and finding proxies for the ability to form expectations (e.g. education) and for the

compactness of the subjective probability distribution (e.g. proximity to retirement) it should be possible to distinguish between these two hypotheses. This is explored by means of a probit regression of a dummy variable that takes the value one for a 'don't know' response. The full results are given in Table A2.3. The main findings are:

- The further away is actual retirement, the more likely is a 'don't know' response. Individuals who retired within one year of wave 1 were significantly more likely to have given an expected retirement date in wave 1. On the other hand, individuals who had not retired by wave 2, by which time over 5 years had elapsed since wave 1, were more likely to have given a 'don't know' response at wave 1. This supports the idea that a "don't know" reflects a genuinely greater degree of uncertainty. In fact, when asked the same expectations question in the second wave if they have still not retired, the majority of 'don't knows' do give an expected age of retirement. A plausible interpretation of the positive significant effect of the individual liking their current job on the probability of giving a 'don't know' response is that these people tend to retire later on average.

- In general, the greater the individual's involvement with the labour market in full-time employment during their working lives (and the less variable their employment experience), the less likely it is that they give a 'don't know' response. Men who have spent more than 95% of their time since age 25 in full-time employment are less likely to give a don't know response. Among women, the greater the proportion of time spent not working, the more likely it is that they give a 'don't know'

response, although this is not significant.

- For men, having an occupational pension has a significant, negative effect on the 'don't know' response probability. This is likely to reflect the presence of normal (and early) retirement ages with clear retirement incentives in many occupational schemes.

- Poor health (measured by severity score at wave 1) is also associated with a higher probability of giving a 'don't know' response which may indicate greater uncertainty over future labour market participation.

- For men, being divorced or widowed in wave 1 also means a higher probability of a 'don't know' response although this result is hard to interpret.

- A don't know response is not associated with lower educational attainment *per se* although, as Carlson and Parkin (1975) point out, low educational attainment may be correlated with other factors such as interrupted career history. But the variable 'has saved for retirement', which is also significant for men, is likely to reflect a greater propensity to think about future retirement.

Given the small sample size and the proxy nature of many of these variables, these results are not conclusive. But they do lend some support to the argument that 'don't know' responses to the retirement expectations questions may reflect genuinely greater uncertainty about retirement. At the very least, these results show that the probability of giving 'don't know' responses is not random across

the population.

2.4 Comparing reported expectations and outcomes

In total nearly half of the sample retired when they said they expected to (Table 2.4, panel A) and nearly two-thirds retired within one year of their reported expected retirement age (Table 2.4, panel B). The cumulative distributions of actual and reported expected retirement ages are plotted in Figure 2.3. For women, the 'fit' is surprisingly good; but men are more likely to retire earlier than they said they expected to and the cumulative retirement probability distribution is much smoother than the distribution of reported expected ages. As already discussed, with point expectations data and only two waves, this is not an explicit test of rational expectations. Nevertheless, it is interesting to see whether there are identifiable shocks that may have caused expectations and realisations to diverge.

Table 2.4

Comparing retirement expectations and outcomes

Panel A: At expected age

	Retired before expected age	Retired at expected age	Retired after expected age	No. obs
Whole sample	37.2%	46.8%	16.0%	421
Men	43.5%	44.2%	12.4%	265
Women	26.7%	51.2%	22.1%	156

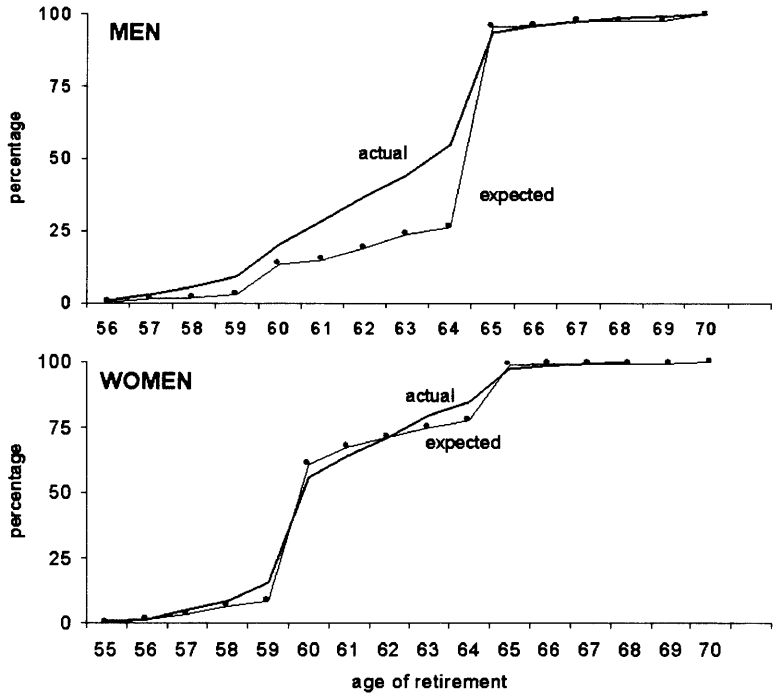
Panel B: Within one year of expected age

	Retired before expected age	Retired at expected age	Retired after expected age	No. obs
Whole sample	25.8%	65.5%	8.7%	421
Men	31.4%	62.4%	6.2%	265
Women	16.3%	70.9%	12.8%	156

Source: Retirement Survey

Figure 2.3

Cumulative distribution of expected and actual retirement ages



Source: Retirement Survey

This is done by means of an ordered probit regression on a dependent variable that takes the value 1, 2 or 3 according to whether individuals retire before, when or after they said they expected to. The number of years until expected age of retirement is included as a conditioning variable since the sooner the expected age of retirement, the less likely it is that individuals will retire before they said they expected to. The full results are reported in the Appendix (Table A2.3). The

main findings are:

- None of the employment history variables, which affected whether or not individuals could form any point expectation, affects whether they retire when they expected to. However, employment status in Wave 1 does have a significant effect on 'getting it right' (or wrong). Men who were unemployed at the first wave of the survey are significantly more likely to retire earlier than expected. This may indicate that unemployment is associated with earlier than anticipated retirement as older workers find it harder than expected to re-enter employment (and/or face stiff wage penalties). Of course, with only two waves, it is not possible to generalize this finding beyond the experience of the early 1990s (a time of recession in the UK), but it corresponds with the analysis in chapters 1 and 3 on involuntary early retirement.

- An increase in severity score between the two waves of the survey is associated with individuals being more likely to retire earlier than expected. Of course, given the use of disability benefits as an early retirement vehicle, the reported severity score in the second wave may reflect measurement error and/or post-hoc rationalisation. But Disney et al (2004), using a more robust specification that instruments the (endogenous and noisy) self-reported health variable also find that adverse individual shocks to health stocks are a significant predictor of individual retirement behaviour among workers aged 50 and over.

- Finally, a change in marital status is significant for men and is associated

with earlier than expected retirement.

2.5 Conclusions

This chapter has examined expectations of retirement age in order to assess the extent to which individuals are engaging in forward-looking behaviour and to look for possible shocks that may cause expectations and outcomes to diverge.

The distribution of expected retirement ages is heavily concentrated and dominated by spikes at the state pension ages. A high proportion of people also report that they don't know when they expect to retire. But, reported ages do vary systematically with individuals' observable characteristics in a sensible way. More importantly from the point of view of modelling actual retirement behaviour, reported expectations have some additional predictive power for actual retirement behaviour above their correlation with individuals' observable characteristics.

The evidence supports the hypothesis that point expectations are a measure of central tendency of individuals' underlying probability distribution, but more likely to reflect the mode/ median than the mathematical expectation. There is also some evidence that a "don't know" response may reflect a higher level of uncertainty rather than being a lazy or uninformed response. A particularly important finding in this respect is that the majority of individuals who responded don't know in the first wave of the survey do give point expectations in the second wave at which point some uncertainty may have been resolved.

There is systematic deviation between individuals' reported expectations and their

actual retirement ages, with men retiring earlier than expected on average. There is some evidence that unemployment and health may lead to earlier than expected retirement. The next chapter explores this further by looking at whether there are differences in spending and measures of well-being at retirement between those who appear to retire voluntarily and those for whom early retirement may be involuntary.

Annex 2: Further regression results

Table A2.1

When do people expect to retire?

Ordered probit regression. Dependent variable 1 = expects to retire before state pension age, 2 = expects to retire at state pension age, 3 = expects to retire after state pension age

	Men		Women	
	Coeff	SE	Coeff	SE
Individual characteristics				
Age in Wave 1	.1247**	.0271	.3086**	.0500 *
Ln(individual income) in W1	-.0681	.1053	.1800	.2194
No educational qualification	-.0048	.1542	.3003	.2101
Married in W1	-.3293	.2775	-.5811	.4629
Divorced/ widowed in W1	-.2693	.3705	-.5741	.4847
W1 severity score 2-3	-.2701	.3124	-.1445	.5127
W1 severity score > 3	-.5803	.5289	-1.0652**	.4762*
Occupational pension	-.5394**	.1927	-.2359	.2392
Saved for retirement	-.2502	.1556	.1811	.1954
Employment status and history				
Unemployed in W1	-.3782	.3759	-.1412	.5880
Part-time employed in W1	1.0053**	.4292	.6207**	.2646*
Self-employed in W1	-.0464	.2969	1.3922**	.5727*
FT employed > 95% since age 25	-.3583*	.2161	-.5899	.4914
% time not working since age 25	-.1910	.9942	.1911	.5524
Cut1	4.9830**	1.690	16.599**	3.161*
Cut2	7.9577**	1.733	18.720**	3.202*
Number of observations	362		193	
Log likelihood	-213.42		-130.80	
Pseudo R^2	0.166		0.240	
LR $\chi^2(24)$, men; LR $\chi^2(14)$, women	84.96*		82.62*	

** Significant at 5% level *Significant at 10% level

Regression for men includes a set of 10 regional dummies which are jointly significant at 5% level. Regional dummies are not significant in the case of women, and are excluded.

Table A2.2

Characteristics of "don't knows"

Results of a probit regression. Dependent variable 1 = gives don't know response, 0 = gives point expectation

	Men		*Women*	
	Marginal effect	*Standard Error*	Marginal effect	*Standard Error*
Individual characteristics				
Age in Wave 1	.0148**	*.0054*	.0194*	*.0109*
Ln(individual income) in W1	-.0184	*.0165*	-.1582**	*.0531*
No educational qualification	.0088	*.0296*	-.0948	*.0678*
Married in W1	.0530	*.0402*	-.1641	*.1965*
Divorced/ widowed in W1	.2330**	*.1516*	.0077	*.1765*
W1 severity score 2-3	.1007	*.0947*	.3180*	*.1946*
W1 severity score > 3	.2025*	*.1590*	-.0470	*.1493*
Occupational pension	-.1337**	*.0441*	-.0097	*.0697*
Saved for retirement	-.0569*	*.0313*	-.0400	*.0580*
Likes current job	.0476*	.0281	.1233**	.0586
Employment status & history				
Unemployed in W1	-.0358	*.0647*	-.0118	*.1595*
Part-time employed in W1	-.0053	*.0674*	.1940**	*.0762*
Self-employed in W1	-.0094	*.0429*	.1839	*.2024*
FT employed > 95% since age 25	-.0961**	*.0467*	.0772	*.1919*
% time not working since age 25	-.3030	*.2966*	.2175	*.1549*
Distance from actual retirement				
One year or less	-.0848**	*.0231*	-.1893**	*.0571*
Not retired Wave 2 (>5 years)	.1282**	*.0437*	.1064	*.0724*
Number of observations	426		270	
Log likelihood	-132.85		-122.64	
Pseudo R^2	0.2737		0.2520	
LR $\chi^2(27)$	100.15*		82.63*	

** Significant at 5% level *Significant at 10% level

Regressions for men and women includes a set of 10 regional dummies which are jointly significant at 5% level

Table A2.3

Retirement expectations and outcomes

Results of an ordered probit model. Dependent variable 1 = retires before expected age, 2 = retires at expected age, 3 = retires after expected age

	Men		Women	
	Coeff	SE	Coeff	SE
Individual characteristics				
Age in Wave 1	-.0535	.0399	-.0192	.0515
Ln(individual income) in W1	.1763	.1256	-.3270	.2412
No educational qualification	.4630**	.1806	.1908	.2375
Married in W1	-.3071	.2981	.9196*	.4789
Divorced/ widowed in W1	-.7261*	.4382	.7640	.5042
W1 severity score 2-3	-.0792	.3422	-1.176**	.5610
W1 severity score > 3	.2757	.5423	-.1450	.5559
Occupational pension	-.0715	.2425	.2707	.2665
Saved for retirement	-.0151	.1821	.1046	.2130
Likes current job	-.0000	.1713	-.1300	.2031
Employment status & history				
Unemployed in W1	-1.231**	.4071	-.2726	.7224
Part-time employed in W1	.7614	.4726	-.0790	.2838
Self-employed in W1	-.0039	.3429	1.414**	.6976
FT employed > 95% since 25	.2320	.2386	-.0486	.5024
% time not working since 25	1.450	.9850	-.1478	.5782
'Shocks'				
Change in severity score	-.3063*	.1813	-.4080*	.2413
Change in marital status	-.8305*	.4790	.0712	.3322
Number of years until expected age of retirement	-.4249**	.0529		
Cut1	-4.5316	2.6868	-3.687	3.311
Cut2	-2.5308	2.6778	-1.867	3.306
Number of observations	245		150	
Log likelihood	171.034		122.298	
Pseudo R^2	.2828		0.2110	
LR $\chi^2(18)$	134.9		65.42	

* Significant at 5% **Significant at 10%

Chapter 3: Involuntary retirement and the retirement-consumption puzzle

Chapter 1 showed that, for a sizeable minority of men, retirement appears to be involuntary. These are cases where individuals enter retirement via another non-working state and are more likely to receive unemployment or disability benefits, rather than start drawing a pension when they leave employment. Chapter 2 supported the idea of involuntary retirement by showing that earlier than anticipated retirement could be linked to health shocks (measured by changes in severity scores) and unemployment. This chapter explores whether involuntary early retirement might, at least partly, account for the well-documented fall in spending at retirement (the "retirement-savings" puzzle). Earlier than expected retirement – through ill-health or redundancy[32] – is likely to be associated with a negative wealth shock because of lost earnings and/or pension wealth that might cause people to reduce their spending at retirement, rather than smoothing it. This chapter explores this idea by categorizing retirements as "voluntary" or "involuntary" and comparing what happens to spending across the two groups. If

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32 Of course, redundancy does not necessarily lead to retirement (permanent labour market exit), but the wage cut someone would have to take in getting another job may be enough to make them stop working altogether.

spending falls only among the group of involuntary retirees, it would be consistent with the retirement-consumption puzzle being at least partly resolved in terms of a negative wealth shock.

3.1 Introduction

A number of studies have found that average consumption falls significantly at retirement, even allowing for obvious work-related spending items (see Hamermesh, 1984, Banks et al, 1998, Bernheim et al, 2001, Ameriks et al, 2002, Hurd and Rohwedder, 2003, Miniaci et al, 2003, Haider and Stephens, 2007, Aguiar and Hurst, 2005, and Blau, 2004). This fall, common across a number of countries (US, UK and Italy), across different time periods and across different measures of spending, is at odds with the predictions of a simplified life-cycle model of consumption and has become known as the "retirement-consumption puzzle".

Looking at consumption at retirement is important for at least two reasons. First, it can give insights into how well off people are in retirement, compared to when they are working. Particularly if retired people hold substantial levels of (non-annuitised) wealth which they use to finance consumption, looking directly at spending may provide a better measure of how well off people are than income replacement rates.

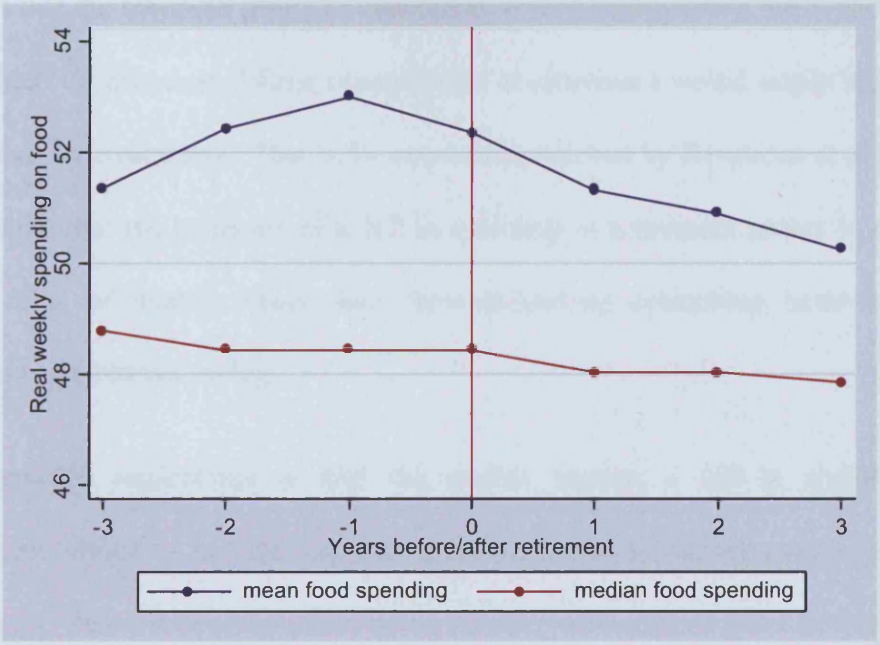
Secondly, it may provide one way of assessing whether people have saved enough for their retirement, an issue attracting increasing policy interest in the UK given the government's deliberate attempt to shift more of the burden of pension provision from the state to individuals. Looking at what happens to people's

spending in retirement is one possible way to gauge the adequacy of their saving – if people have to reduce spending, contrary to the predictions of a forward-looking life-cycle model of consumption and saving, it may suggest that they have not saved enough. But, before drawing policy conclusions, it is important to try to understand why the drop in spending has occurred – whether because of irrational financial planning prior to retirement (Bernheim, et al (2001), or earlier than expected retirement (Haider and Stephens, 2007)) and/or lower than expected pension income, or something else. Indeed, a fall in spending may be optimal given increased leisure time (Hurd and Rohwedder, 2003, Aguiar and Hurst, 2005).

This chapter revisits the retirement-consumption puzzle and looks at what happens to spending on food at retirement using panel data drawn from the British Household Panel Survey (BHPS). Consistent with the earlier findings for the UK (Banks et al, 1998), the data do show evidence of a fall in mean (and median) spending on food around the time of retirement (see Figure 3.1).

Figure 3.1

Spending on food before and after retirement



Source: British Household Panel Survey

The rest of the chapter is as follows. The next section summarizes previous, related studies on the retirement-consumption puzzle. Section 3.3 discusses the data and the definitions of voluntary and involuntary retirements and presents some simple descriptive statistics, while section 3.4 presents the results of fixed-effects regressions comparing spending at retirement for voluntary and involuntary retirees. Section 3.5 offers some conclusions.

3.2 The puzzle and possible resolutions

The fact that observed consumption falls at retirement is a challenge to the simple, one-consumption-good life cycle model. In its simplest form, with utility

dependent only on consumption, no uncertainty and assuming that marginal utility is continuous and declining in consumption, the maximisation of lifetime utility implies that the marginal utility of consumption, and consumption itself, should be smoothed. In this case, falling consumption at retirement would imply irrational behaviour by consumers. This is the conclusion reached by Bernheim et al (2001) who argue that the evidence of a fall in spending at retirement points to people using rules of thumb, rather than forward-looking optimising behaviour, to determine retirement saving.

One possible explanation is that the studies capture a fall in *spending* at retirement, which is not the same as a fall in utility-producing *consumption* at retirement. Households may stock up on durables immediately prior to retirement and enjoy a higher flow of services from durables after retirement; thus while their observed spending may fall, their overall consumption remains the same. However, Miniaci et al (2003) find no evidence of pre-retirement stocking up of durables. Another possible explanation is that there is a necessary level of (non-utility-producing) spending associated with working, for example the cost of buying suits and travelling to work, that stops when people retire. Again, this would imply that, while observed spending falls, (utility-producing) consumption may be smoothed over retirement. This effect will be reinforced to the extent that the spending of the retired on certain items is subsidised (transport and prescription charges in the UK, health in the US). However, Banks et al (1998) take out obvious work-related spending items from total spending and look at sub-components of spending and still find evidence of a fall at retirement.

Two possible extensions to the simple life cycle model, however, would be

consistent with a fall in spending at retirement.

One possibility is that spending falls as a result of the big increase in leisure on retirement.[33] Spending would fall either, if consumption and leisure are substitutes in a household utility function, or if time is a substitute for spending in a household production function to generate consumption. Aguiar and Hurst (2005) use detailed information on food intake and time use in the US to show that, despite a fall in spending on food, nutritional content and quality are maintained and that more time is spent on shopping and food preparation.

As evidence in support of the leisure-substitution hypothesis, Hurd and Rohwedder (2003) show that most people anticipate that spending will fall at retirement and, if anything, that the anticipated decline is greater than the fall in spending that actually occurred among (a different group of) those who had already retired (20% compared to 12% among married couples, for example). Ameriks et al (2002) also find that many people expect to spend less in retirement.

However, this evidence, while interesting, is not conclusive about the mechanism that causes actual spending to fall (people may anticipate that spending will fall if they are following a simple rule of thumb, for example). Hurd and Rohwedder's evidence is less convincing for being based on cross-section analysis and there are important differences between sub-groups. For example, anticipated declines in spending at retirement vary little with income, wealth and health status, but the

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33 There is clearly an issue about whether such a discrete change is optimal from the individual's point of view given diminishing marginal returns to leisure. See chapter 1 for further discussion of the discrete/ gradual nature of retirement.

actual falls in spending are far greater for those who, post-retirement, are in the bottom income and wealth quartiles and self-report poor health. Using data from the earlier Retirement History Survey, which does link expected and actual changes in spending for the same people, Haider and Stephens (2007) show there is little correlation between the two – the fall in spending that occurs in retirement is broadly the same whatever people's prior expectations.

A second possible explanation for the fall in consumption is that retirement may be associated with a negative shock to wealth. If retirement is earlier than anticipated, for example, there may be lost earnings and/or pension accrual. Evidence presented in the two previous chapters supports the idea that there may be shocks to the timing of retirement, at least for a (fairly substantial) minority. In chapter 1 it was shown that around one-third of people fell that the timing of their retirement was forced; ill-health and redundancy appear to be the most likely factors that account for such involuntary retirements. These findings were confirmed in chapter 2, which showed more than one-third of people retiring before their expected age of retirement. Of course, earlier than expected retirement may follow from a positive wealth shock, but earlier than expected retirement is linked to both unemployment and changes in health. With self-reported health status, the findings on the relationship between retirement and health are not conclusive. But, instrumenting self-reported health status, Disney et al (2004) present more conclusive evidence that changes in health are associated with early retirement.

A number of previous studies have explored whether uncertainty over the timing of retirement may lie behind the observed fall in spending. Blau (2004) calibrates

a model of retirement showing that uncertainty over the timing of retirement will generate a fall in spending if retirement is a discrete event. Banks et al (1998) and Bernheim et al (2001) explore whether spending falls when retirement is anticipated by instrumenting retirement with lagged retirement and age respectively. In both cases, the drop is smaller when retirement is anticipated (although not eliminated altogether). For the US, Haider and Stephens (2007) reach a similar conclusion using subjective retirement expectations as the instrument. With no data on spending in the retirement survey, it is not possible to follow Haider and Stephens' approach. This chapter adopts a different approach to testing the hypothesis that the fall in spending may be linked to unanticipated early retirement, that is to compare the spending of "voluntary" and "involuntary" retirees. The next section discusses in detail how these two groups are defined.

3.3 The data

The data are drawn from the first eleven waves of the BHPS (see Annex 1 for further details on the survey). The analysis focuses on a cohort of men aged 45 – 64 in the first year of the survey, a total sample of around 2,000. Since the BHPS covers all ages, it has a smaller number of individuals in the relevant age range for studying retirement than, for example, the US Health and Retirement Survey and the new English Longitudinal Survey of Ageing. Nevertheless, there is a reasonable-sized sample of more than 500 retirements[34] and a wide number of variables, including information on spending, well-being, income and health. As

34 See Bardasi et al (2000) for a study of incomes at retirement using the BHPS

discussed further below, the variables are often not ideal – the information on spending, for example is very limited compared to the Family Expenditure Survey, used by Banks et al, 1998, in their analysis of spending at retirement. This is discussed further in the concluding section.

Voluntary/ involuntary retirement

Chapter 1 showed that there is a variety of routes into retirement. The majority of men retire (ie self-report that they are retired) from (usually full-time) employment, but as shown in Figure 3.2, around 40% of men move into retirement from another (self-assessed) non-working state, usually unemployed or long-term sick/disabled, and there is an increasing proportion of men in these non-working, non-retired states in the run-up to retirement.

Figure 3.2

Employment status prior to retirement

Source: British Household Panel Survey

When people are asked to give their reasons for early retirement, the answers, summarized, in Table 3.1, broadly reflect varying degrees of voluntarism – "offered reasonable financial terms" and "to enjoy life while young and fit" suggest that early retirement was the individual's own voluntary choice, while "own ill-health" and "redundant, dismissed and no choice" suggest that the individual retired earlier than they may have anticipated and/or wanted to. Of course, these reasons may reflect an element of post-hoc rationalisation and/or recall error. But, as in earlier work (Tanner, 1998) there is a strong link between the route into retirement and the reason given. Those who report ill-health or redundancy as the main reason for early retirement are more likely to enter retirement through another non-working state, while those who enter retirement straight from employment are more likely to report reasonable financial terms or enjoying life while young and fit.

Table 3.1

The (main) reason for early retirement

	All	Retired from work	Retired from non-work
Own ill-health	23.3%	15.0%	48.5%
Redundant/ dismissed/ no choice	18.1%	15.0%	27.3%
Offered reasonable financial terms	31.6%	36.0%	18.2%
To enjoy life while young and fit	15.8%	20.0%	3.0%
Other	11.2%	14.0%	3.0%
Total	100%	100%	100%

Source: British Household Panel Survey

This suggests that there are (at least) two distinct experiences of retirement. For the majority of people, retirement appears to be, broadly, voluntary. In these cases, people enter retirement straight from employment and, if they retire early, do so because they are offered reasonable financial terms or to enjoy life while young and fit. For some, however, there is evidence that retirement is involuntary. They are more likely to cite ill-health or redundancy as the main reason for retiring early and to enter retirement from employment via another non-working state (suggesting that at the time they leave work, they may not anticipate that their exit is going to be permanent). For the retirement-consumption puzzle, this distinction is potentially important because those who retire involuntarily, earlier than they anticipated or wanted, are more likely to experience a negative shock to their wealth through lost earnings or pension accrual that may cause them to reduce spending in retirement. The issue explored here is whether there are observable differences in spending at retirement for the two types of retirees that would support this hypothesis.

For the purpose of this analysis, the two types of retirement – voluntary and involuntary – are defined in the following way:

- **"Voluntary retirees"** – retire directly from working, are observed to work for at least two consecutive periods prior to retiring and are not observed to re-enter employment after retirement (= 226 retirements).

- **"Involuntary retirees"** – retire from a non-work employment state (typically unemployed or long-term sick/ disabled), are observed working

prior to becoming unemployed/sick and are not observed to re-enter employment after reporting themselves as retired (= 57 retirements). In these cases, the date of retirement is redefined to be when the person left work rather than when they first self-reported themselves as retired.

Table 3.2 below provides further detail on how individuals are categorized as voluntary or involuntary retired. The sequence of employment states (work or non-work) in (up to) the five periods prior to the individual reporting themselves as retired is analyzed. If the individual is working in (at least) two consecutive periods immediately prior to retirement, they are classed as retiring voluntarily. If they experience a period of not-working immediately prior to retirement, but have previously been observed working, they are classed as retiring involuntarily.

Table 3.2

Voluntary and involuntary retirees

Pre-retirement sequence W = working, NW = not working	Retirement type	Number of observations
W_W	Voluntary	49
W_NW	Involuntary	8
W_W_W	Voluntary	21
W_W_NW	Involuntary	6
W_NW_NW	Involuntary	5
W_W_W_W	Voluntary	20
W_W_W_NW	Involuntary	11
W_W_NW_NW	Involuntary	3
W_NW_NW_NW	Involuntary	2
W_W_W_W_W	Voluntary	133
W_W_W_W_NW	Involuntary	8
W_W_W_NW_NW	Involuntary	5
W_W_NW_NW_NW	Involuntary	4
W_NW_NW_W_W	Voluntary	2
W_NW_NW_NW_NW	Involuntary	5
NW_W_W_W_W	Voluntary	1
TOTAL		283

Source: British Household Panel Survey

The number of retirements that can be allocated to one of these two groups (283) is smaller than the total number of retirements observed in the BHPS sub-sample

(around 500). In the majority of cases this is because the person is never observed in work prior to retirement.[35] In other cases, it is because the person re-enters employment after declaring themselves to be retired. The assignment of individuals as "voluntary" or "involuntary" retirees inevitably has a degree of arbitrariness – for example the requirement that individuals are observed not to re-enter work will be more restrictive for those who are observed to retire earlier in the survey period.[36] Section 3.4 below reports regression results using an alternative definition of being out of work for two consecutive periods. Another possible alternative would be to use the reasons given for early retirement to categorize people as voluntary and involuntary retirees. However, since these are available only in wave 11, this would tend to reduce the sample size further and, as stated above, the responses may be subject to post-hoc rationalisation and/or recall error.

The characteristics of the two groups of retirees are fairly distinct, as shown in table 3.4 below. Voluntary retirees tend to have higher occupations and educational qualifications and are more likely to have an occupational pension. Involuntary retirees are more likely to report that their health limits their daily activities.[37] This raises the possibility that any observed differences in spending

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35 This is important since retirement for involuntary retirees is re-defined as when they leave work rather than when they move from non-work to "retired".

36 Also, the employment states are those at the time of interview, whereas some individuals may change employment state between interviews.

37 This variable is not available in wave 9 of the BHPS and must be imputed. See Section 3 for details.

between the two groups may be attributable to the different characteristics of the groups rather than the nature of their retirement and this is explored further in the regressions below.

Table 3.3

Characteristics of voluntary and involuntary retirees

	Voluntary Retirees	Involuntary Retirees
Professional/ managerial occupation	27.9%	17.9%
Manual occupation	52.7%	64.3%
Occupational pension	59.3%	56.1%
Worked in the public sector	76.6%	80.7%
Higher educational qualification	30.9%	17.9%
No educational qualification	31.8%	44.6%
Health limits daily activities (in retirement)	20.3%	42.3%
N	226	57

Source: British Household Panel Survey

Measures of spending in the BHPS

The BHPS only collects information on food spending in all waves. Clearly it would be preferable to have a fuller measure of household spending, but as a necessary good with a small income elasticity, food provides quite a strong test of consumption smoothing; if households do not smooth spending on food, they are unlikely to smooth other forms of spending (although if food spending is

smoothed, it can not be rejected that total spending falls).

Respondents are asked "approximately how much does your household usually spend each week in total on food and groceries." In the first wave, they are asked to give a continuous answer; in subsequent waves, they are asked to say in which band (out of 12) their weekly food spending lies. They are told to include all food, bread, milk, soft drinks etc, but asked to exclude pet food, alcohol, cigarettes and meals out. Take-aways eaten in the home are, however, included.

To obtain a weekly spending figure, each individual is assigned the mid-point of their reported band each year, adjusted for inflation in food prices.[38] Comparisons with the more detailed spending information in the Family Expenditure Survey shows that mean food spending in the BHPS is slightly higher than in the FES.[39] In part this may reflect the fact that there are fewer observations in the lowest bands in the BHPS (respondents may ignore atypical weeks when they spend very little). Alternatively, respondents may include other grocery items that they regularly buy at the supermarket such as washing powder, toilet roll etc. When these items are included in the FES spending figures, the two sets of numbers are very similar.

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38 For wave 1, the continuous answers are first banded, and then the midpoints are assigned.

39 To calculate the FES figures, the continuous weekly spending figures are converted into bands and then mid-points as in the BHPS.

Income and spending before and after retirement

Table 3.4 summarizes household income and food spending for the two groups of voluntary and involuntary retirees, averaged across all periods before retirement and after. Figures 3.3 and 3.4 present the same information slightly differently, showing the paths of the variables in each of the three years before, and the three years after, retirement. In the figures, year 0 represents the first year in which the individual is retired.

Table 3.4

Mean income and spending

	Before retirement	After retirement
Real weekly household income		
Voluntary retirees	£503	£274
Involuntary retirees	£415	£274
Real weekly household food spending		
Voluntary retirees	£54	£51
Involuntary retirees	£58	£51

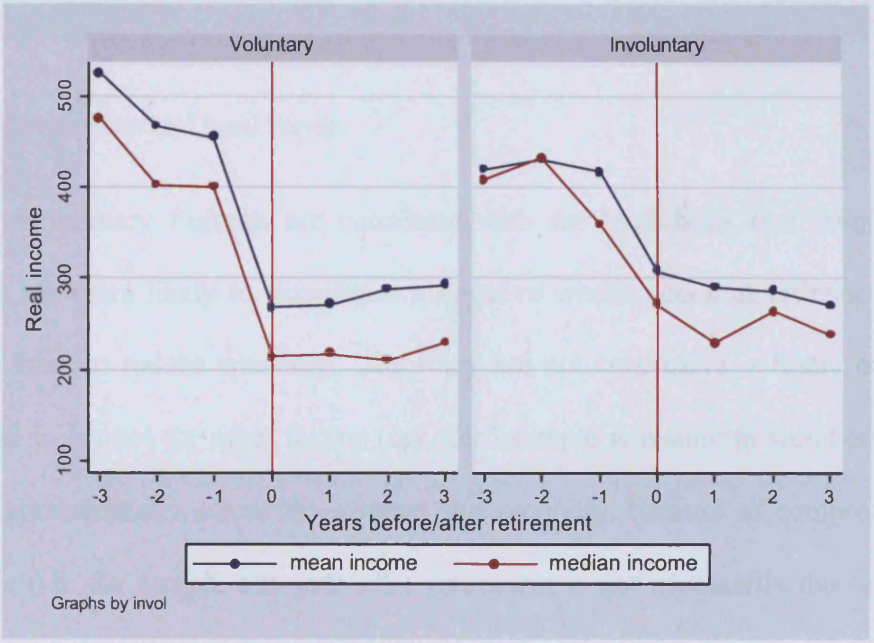
Source: British Household Panel Survey

As would be expected from their higher level of qualifications and occupational groups, voluntary retirees have higher average incomes prior to retirement. After retirement, however, average incomes of the two groups appear to be very similar. Figure 3.3 shows that both groups experience a fall in income coinciding with retirement – the fall is absolutely and relatively greater for voluntary retirees.

The summary statistics provide evidence that food spending at retirement also behaves differently for the two groups. In spite of a bigger fall in income, voluntary retirees experience a smaller fall in food spending. Their average food spending is around £3 a week lower after retirement than before; among involuntary retirees average food spending after retirement is around £7 lower than it was pre-retirement. This pattern is reflected in Figure 3.4 – for voluntary retirees, the path of spending is broadly maintained through retirement, while for involuntary retirees, there is evidence of a fall in spending around retirement.

Figure 3.3

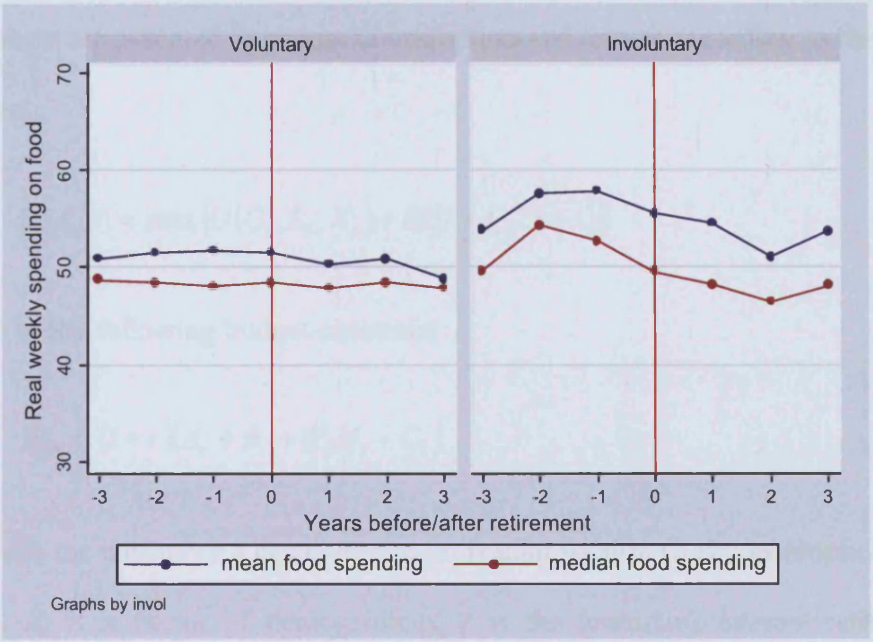
Average weekly real income (£), by retirement type



Source: British Household Panel Survey

Figure 3.4

Average weekly real food spending (£), by retirement type



Source: British Household Panel Survey

These preliminary findings are consistent with the hypothesis that involuntary retirees are more likely to experience a negative wealth shock at retirement that causes them to reduce spending. But, they are not conclusive – firstly because they fail to control for other factors (age, for example is related to well-being and varies systematically across the groups) and secondly, because of compositional changes (i.e. the sample one year after retirement is not necessarily the same as the sample two years after retirement and so on). The next section presents the results of regression analysis that tries to control for both these factors.

3.3 Estimation

The estimation approach is derived from a marginal-utility-of-wealth-constant

consumption demand function, or Frisch function (see Browning, Deaton and Irish, 1985, and Blundell and Macurdy, 1999)

Consumers are assumed to choose consumption and leisure according to the value function:

$$V(A_t, t) = \max\{U(C_t, L_t, X_t) + \delta E[V(A_{t+1}, t+1)]\}$$

subject to the following budget constraint:

$$A_{t+1} = (1+r)(A_t + B_t + W_t H_t - C_t)$$

where d is the consumer's discount rate, A_t is total wealth, C_t is consumption, L_t is leisure, X_t is a vector of demographics, r is the (constant) interest rate, B_t is unearned income, W_t is the wage rate and H_t is number of hours worked.

This yields the following first-order-condition for the marginal utility of consumption and the marginal utility of wealth, ?t ($= \partial V / \partial A_t$):

$$U_C(C_t, L_t X_t) = \lambda_t$$

$$\lambda_t = \delta E_t[\lambda_{t+1}(1+r)]$$

implying a consumption demand function of the form, $C_t = C(\lambda_t, W_t, X_t)$.

This allows consumption demand to be expressed as a function of an individual's current characteristics (including wages) and a single statistic – the marginal utility of wealth – capturing all other (expected) future information that determines the level of consumption today. This will include the effect of

retirement where it is fully anticipated.

With uncertainty, shocks will be reflected in changes in the marginal utility of wealth from one period to the next. It is possible to express the stochastic process for the marginal utility of wealth as follows:

$$\ln \lambda_t = b_t^* + \ln \lambda_{t-1} + \varepsilon_t^* = \sum_{j=1}^{t} b_j^* + \ln \lambda_0 + \sum_{j=0}^{t} \varepsilon_j^*$$

(where b^*_t depends on the discount factor, the interest rate and the moments of the forecast error e^*_t). With this specification, the marginal utility of wealth can be captured by an individual fixed effect, $?_0$, plus a function of age plus a random error term, reflecting expectational error in the current period.

This allows consumption demand to be modelled as a function of an individual's characteristics (X_{it}), age (A_{it}), an individual fixed effect (ω_i) and an expectational error term (u_{it}):

$$\ln C_{it} = \beta' X_{it} + \gamma_1 A_{it} + \sum_{g=1}^{2} \delta_g G_i R_{it} + \omega_i + u_{it}$$

Note that wages are not included directly, but are assumed to be determined by the individual's characteristics and age. The expression for consumption given here also includes a variable, R_{it} for whether the individual is retired or not, and an identifier, G_i, denoting which of the two groups of retirees they belong to (G_i=1 if retirement is voluntary, =2 if retirement is involuntary). This interaction term is included in the estimation to capture the extent to which spending (differentially) changes at retirement for voluntary and involuntary retirees. If retirement is fully

anticipated then, under the model specified above, there should be no change in spending since the effect of retirement would already have been captured in the (constant) marginal utility of wealth. But, if involuntary retirement results in a negative shock to wealth through loss of earnings or pension accrual, retirement will coincide with an expectational error that causes consumption to change. The interaction term is not intended directly to estimate the effect on consumption of retirement per se, but the extent to which retirement – and involuntary retirement in particular – is accompanied by an expectational error that results in a fall in spending. If the initial hypothesis is correct, there should be a significant fall in spending only where retirement is involuntary.

The assignment of individuals into groups of voluntary and involuntary retirees is somewhat akin to an instrumental variables approach. Ideally, what would be included in the regression is whether the individual experiences a negative wealth shock on retirement, but this is unobserved. Instead, what is included is a term if the retirement is involuntary, on the basis that this is likely to be correlated with any unobserved wealth shock. As the analysis in the previous section showed, involuntary retirement is more likely to occur as a result of ill-health or redundancy, both of which are likely to mean loss of earnings and/or pension accrual.

In order to interpret a significant coefficient on involuntary retirement as an indicator of a negative wealth shock, there can be no direct link between an individuals' self-reported employment state and their level of spending. Clearly, this may not be true in the case of ill-health which is linked to involuntary retirement and may also have a direct effect on spending. The regression

therefore includes a number of variables which attempt to control for health status. It is assumed that other factors that may result in involuntary retirements do not have a direct effect on spending other than through their effect on being retired.

3.4 Regression results

Table 3.5 reports the results from the fixed effects estimation. In all cases, retirement is included as a state variable (ie R = 1 if the individual is retired). Because the BHPS asks about "usual spending on food", it is likely that any reported change in food will be gradual and will be more likely to be picked up by the state variable than by a transition variable.[40]

The results in column (1) show that, for the sample as a whole, there is a small, insignificant fall in spending after retirement. Column (2) shows the effect of adding a dummy for involuntary retirement. The regression results confirm the preliminary findings from the previous section. The coefficient on retirement, capturing the change in spending associated with voluntary retirement, is insignificant, but for involuntary retirements the coefficient is negative and significant: Involuntary retirement is associated with a fall in food spending of around 11% and this is significantly different to what happens to spending when retirement is voluntary. This is consistent with the hypothesis that involuntary retirement is associated with a negative wealth shock that causes a fall in spending. It is interesting that the fall in spending for involuntary retirees occurs

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40 There is no significant change in reported usual food spending when retirement is included as a transition variable for any of the groups.

in spite of a significantly smaller drop in income (shown by the results in column (4)).

Table 3.5

Main regression results

	(1)	(2)	(3)	(4)
Dependent variable	Log food spending	Log food spending	Log food spending	Log real income
Retired	-0.0178	0.0052	0.0062	-0.5681**
	0.0179	*0.0190*	*0.0189*	*0.0303*
Retired, Involuntary		-0.1036**	-0.0965**	0.1573**
		0.0297	*0.0295*	*0.0476*
Demographic controls	Yes	Yes	Yes	Yes
Health controls	Yes	Yes	No	Yes
N	2505	2505	2505	2505

Notes to table:

Demographic controls = household size, whether the respondent is divorced/widowed/separated, whether the spouse is working, age dummies

Health controls = whether the respondent has health problems, number of health problems (if health problems>0), whether health limits daily activities

Standard errors included in italics, ** denotes statistically significant at the 5% level (two-tailed tests)

Controlling for health is particularly important since ill-health is a cause of

involuntary early retirement and may have a separate direct effect on spending. The BHPS contains a large number of variables measuring individuals' health, but only a limited number of health variables in all ten waves (see Disney et al (2004) for a more detailed analysis of health and labour market exit using the BHPS data). Here, two variables are used as controls for health status. One is the number of health problems reported by the individual in each year (out of a maximum of 13, including arms, legs and hands; sight; hearing; skin conditions/ allergy; chest/ breathing; heart/ blood pressure; stomach/ digestion; diabetes; anxiety/ depression; alcohol & drugs; epilepsy; migraine and other). The other is whether the individual reports that their health limits daily activities. This variable is not present in wave 9, but a value can be imputed on the basis of individuals' responses in waves 8 and 10.[41]

Column (3) reports regression results excluding these health controls for comparison, but there is little change in the results. If anything, poor health appears to be associated with an increase in food spending (possibly a substitution of home consumption for meals out) and the magnitude of the coefficient on involuntary retirement is slightly larger in absolute terms when health controls are included.

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41 For individuals who report the same values in wave 8 and 10 this is fairly straightforward. Where there is a change between waves 8 and 10, the individual is assigned the value in wave 10 (where available), and otherwise the value in wave 8. It makes no difference to the results if, instead, the individual is assigned the value in wave 8 where available and wave 10 otherwise.

Robustness checks

As discussed above, there is an inevitable degree of arbitrariness in assigning individuals into groups of voluntary and involuntary retirees and this raises the possibility that the results may be partly driven by the chosen criteria. This is explored further by re-defining retirement as two consecutive periods out of work after age 50 (following at least one period observed in work). As before, individuals are assumed to retire voluntarily if they report themselves as retired and to be involuntarily retired if they report another non-working state, such as LT sick/ disabled or unemployed. The date of retirement is again taken to be the first period out of work. This is a less restrictive definition of retirement – there is no requirement that individuals do not re-enter work at a later date and there is no requirement (for involuntary retirees) that they self-report themselves as retired. Correspondingly, the sample size is slightly higher (325 retirements).

The fixed effects regression results incorporating this broader definition of retirement are reported in column (1) of Table 3.6. The basic result is the same; there is no significant change in spending if retirement is voluntary, but involuntary retirees do experience a significant drop in spending. Using this broader definition, however, the observed fall in spending is smaller – less than 7%. This is not surprising since this broader definition of retirement potentially allows people who are defined as retired to re-enter work and, correspondingly, experience a smaller loss of earnings/ pension accrual.

Table 3.6

Robustness checks – definition of retirement

Dependent variable = (log) weekly real spending on food

	(1)	(2)	(3)
Retired	0.0043	-0.0138	-0.0065
	0.0169	*0.0144*	*0.0163*
Retired, Involuntary	-0.0674	-0.0549**	-0.0467*
	0.0246	*0.0243*	*0.0273*
Temporarily out of work		-0.0425**	-0.0172
		0.0217	*0.0242*
Log real income	No	No	Yes
Demographic & health controls	Yes	Yes	Yes
N	3300	3835	3835

Notes to table:

Demographic & health controls as in Table 4

"Retired" = two consecutive periods not in work

Standard errors included in italics

** denotes statistically significant at the 5% level, * at the 10% level (two-tailed tests)

To explore this further, column (2) includes temporary spells out of work of not more than one period.[42] They too are associated with a significant fall in spending, but this drop is smaller again than in the case of spells of involuntary

42 i.e. someone is not working in one period, but is in work in the periods immediately before and after

"retirement" of two or more periods out of work. Moreover, as shown in column (3), the drop in spending that occurs with a temporary spell out of work is more strongly linked to contemporaneous income. In general, these results imply that the more permanent the involuntary spell out of work (and the greater the loss of earnings and pension accrual), the larger the fall in spending.

An alternative explanation for why spending at retirement behaves differently for voluntary and involuntary retirees might be that it reflects, not a negative wealth shock associated with involuntary retirement, but some of the differences in their characteristics. To explore this, further regressions are run incorporating additional interaction terms to pick up differences in spending at retirement by, respectively, age of retirement, occupational pension status and educational qualification. The results are reported in Table 3.7. Note that the original, narrower definition of retirement is used.

First, age of retirement. Involuntary retirees retire earlier, on average, than voluntary retirees. Column (2) in panel (a) reports the results when separate interaction terms are included for voluntary retirements that occur at age 65 (the state pension age) and after age 65. When these additional terms are included, and involuntary retirement is compared to voluntary retirements occurring at a similar age (ie before age 65), the coefficient on involuntary retirement becomes even larger (in absolute terms). Thus, the drop in spending when retirement is involuntary can not be attributable to the fact that people retire before the state pension age.

The results in column (1) in panels (b) and (c) lend support to the idea that the

drop in spending among involuntary retirees may be linked to their lower level of occupational pensions and/or educational qualifications (the two are correlated). If no account is taken of whether retirement is involuntary or voluntary, changes in spending at retirement are strongly correlated with pension status and educational qualifications. Spending falls significantly at retirement if someone does not have an employer pension, but not if they do (column 1, panel b). Similarly, spending falls significantly at retirement for someone with no educational qualifications, but not for someone with qualifications (column 1, panel c).

But, if pension status is further interacted with voluntary/ involuntary retirement status, the results in column (2) show that whether or not retirement is voluntary or involuntary also matters. Within the group of men with no employer pension, it is only those who retire involuntarily who experience a significant fall in spending (panel b), while those who retire involuntarily and do have an employer pension experience a (smaller) fall in spending that is significant at the 10% level.

Table 3.7

Robustness checks – characteristics of retirees

Dependent variable = (log) weekly real spending on food

Panel a: Age of retirement		
	(1)	(2)
Retired	0.0052	0.0120
	0.0190	*0.0238*
Retired, Involuntary	-0.1036**	-0.1097**
	0.0297	*0.0325*
Retired at 65, Voluntary		-0.0119
		0.0398
Retired > 65, Voluntary		-0.0184
		0.0385
Demographic & health controls		Yes
Panel b: Employer pension		
	(1)	(2)
Retired	0.0019	0.0155
	0.0205	*0.0220*
Retired, No employer pension	-0.0516**	
	0.0262	
Retired, Voluntary, No employer pension		-0.0293
		0.0297
Retired, Involuntary, Employer pension		-0.0731*
		0.0376
Retired, Involuntary, No employer pension		-0.1732**
		0.0446
Demographic & health controls		Yes
Panel c: Qualifications		
	(1)	(2)
Retired	0.0047	0.0105
	0.0196	*0.0209*
Retired, No qualifications	-0.0701**	
	0.0250	
Retired, Voluntary, No qualifications		-0.0212
		0.0365
Retired, Involuntary, Qualifications		0.0273
		0.0471
Retired, Involuntary, No qualifications		-0.2317**
		0.0435
Demographic & health controls	Yes	Yes

Notes to table:
Demographic & health controls as in Table 4
Standard errors included in italics
** denotes statistically significant at the 5% level, * at the 10% level (two-tailed tests)

It is a similar story with educational qualifications. Within the group of men with no qualifications, it is only those who retire involuntarily who experience a significant fall in spending (panel b). In this case, however, there is no significant fall in spending among those who retire involuntarily and do have higher qualifications.

These results confirm that there is a significant difference in spending at retirement between voluntary and involuntary retirees. In cases where retirement is voluntary, there is little evidence to suggest that spending on food falls, even for those with no employer pension and no educational qualifications. But, the fall in spending associated with involuntary retirement is bigger for those with no employer pension (compared to those with an employer pension) and only significant for those with no educational qualifications (compared to those who do have educational qualifications). Both these characteristics are likely to reflect low levels of lifetime wealth, which may give individuals less of a cushion against negative wealth shocks.

3.5 Conclusions

The earlier UK study of consumption at retirement by Banks et al (1998) concluded that the "evidence strongly suggests that there are unanticipated shocks occurring around the time of retirement". Banks et al (1998) and Bernheim et al (2001) found a smaller drop in spending when retirement was anticipated, but the results depend on the validity of the instruments for retirement – lagged retirement and age respectively. Here, a different approach to looking at the effect of unanticipated early retirement is adopted by looking directly at the evidence on

the nature of retirement. The main finding is that food spending only falls significantly when retirement is involuntary, occurring as a result of ill-health or redundancy for example, and not when retirement is voluntary. This finding is robust to alternative definitions of retirement and cannot be explained in terms of differences in pension status and levels of education between voluntary and involuntary retirees. But, among the group of involuntary retirees, those with no occupational pension experience a larger fall in spending and only those with no educational qualifications experience a significant fall in spending.

This main finding is consistent with the hypothesis that unanticipated early retirement is associated with a negative wealth shock that causes a drop in spending, in particular where lower levels of lifetime wealth mean that people are less able to cushion the effects of an adverse shock. The BHPS evidence suggests that up to 40% of men may retire involuntarily – defined by the reason given for early retirement or the route into retirement. Given the magnitude of the fall in food spending among involuntary retirees (between 7% and 11% depending on the definition used), this would be enough to explain the retirement-consumption puzzle (3% fall in total non-durable spending) observed in the earlier UK study.

The biggest limitation with this study is that it is restricted to food spending. If spending on a basic item such as food falls, then total spending is almost certain to fall, but the same cannot be said if food spending does not fall. The BHPS collects information on two further items of personal spending – meals out[43] and leisure – but only in more recent waves and the sample sizes are not large enough

43 "Meals out" include meals eaten at work and so is a heavily work-related item of spending.

to gain significant results. Nevertheless, the results of preliminary analysis of leisure spending are consistent with the main finding – spending on leisure falls by £3 a week when retirement is voluntary and by £15 a week when retirement is involuntary. As further waves of the BHPS become available, this is something to return to in the future.

Chapter 4: Pension incentives and early retirement

As shown in chapter 1, there has been a fundamental shift in male retirement behaviour over a thirty-year period, during which time, the median age of retirement fell from 65 to 60. A large part of this shift is likely to be attributable to incentives in pension schemes, and in particular, incentives in occupational pensions. The period saw an increase in the number of men who belonged to such schemes (see chapter 1, table 1.4), increased levels of occupational pension wealth among successive cohorts of retirees and a trend for employers to set the scheme rules to facilitate or even encourage early retirement before the state pension age.

Unfortunately, the available data do not allow a detailed examination of the extent to which the trend towards early retirement can be directly attributable to the particular incentives offered by private occupational schemes at this time. Most household and individual surveys that provide information on employment and socio-demographic characteristics do not ask sufficiently detailed questions about occupational scheme rules. In particular, it is not possible to identify the extent to which individuals were offered particular inducements to retire early (early retirement windows).

Instead, the more modest aim of this chapter is to show the degree to which participation choices among older workers can be affected by the incentives in

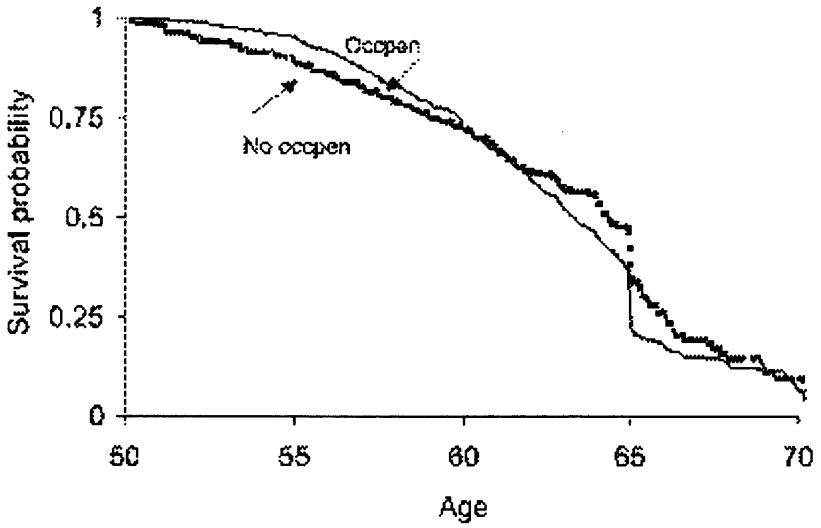
their pension schemes. It does this by modeling the likely (rather than the actual) incentives faced by a cohort of individuals approaching retirement and estimating the effect of these incentives on labour market exit.

Previous analysis has shown clear differences in the retirement behaviour of people with and without (defined benefit) occupational pensions in the UK (see Disney et al, 1994, Meghir and Whitehouse, 1997, Blundell and Johnson, 1998). As shown in figure 4.1, those with occupational pensions are more likely to remain in employment up to age 60 than those without, but more likely to leave after this age.[44] This difference in behaviour has been attributed to the incentive structure of occupational pensions, but this has never been modelled explicitly. One contribution of this analysis therefore is to increase our understanding of the incentive effects of occupational pensions on retirement.

[44] The differences in labour market exits appear to be relatively small, compared to eg the analysis in chapter 1. This is likely to be due to conditioning on labour market participation at age 50. The effects of this selection are not considered explicitly in this analysis.

Figure 4.1

Survival Probability in the Labour Market, Men by Pension Status



Source: Retirement Survey

The next section discusses the underlying approach to estimating the effect of pension incentives on retirement, which is based on the option value model (Stock and Wise, 1990). Section 4.2 describes the data and the approach taken in modeling individuals' retirement incentives. Section 4.3 presents the estimation results and section 4.4 concludes.

4.1 Modeling retirement decisions

The approach to estimating the effect of pension incentives on retirement in this chapter (and in chapter 5) is based on the option value model (Stock and Wise, 1990). In this model, the individual's decision of whether or not to retire today involves a comparison of the expected present value of retiring today with the expected present value of working today, which in turn includes the expected present value of retiring at all possible future ages. Earlier attempts to estimate

the effect of pension incentives on retirement based on lifetime budget constraints (for example, Fields and Mitchell, 1984) or simpler proportional hazard models (for example, Diamond and Hausman, 1984) had considered forward-looking accrual measures defined over a single year or a discrete period of time (for example the anticipated change in pension wealth from working between ages 60 and 65).[45] However, a feature of many pension schemes, occupational pensions in particular, is that accruals may be non-linear. So, for example, for a scheme that offers an early retirement window for people retiring at age 60, the gain in pension received from not retiring at age 58 may be very different to the gain in pension received from not retiring at age 59. The option value model is intended to capture such non-linear accruals by considering the gain from postponing retirement until all possible future ages.

The option value model is intended to capture retirements that are largely voluntary and not the result of eg health shocks or redundancy. It models retirement as an individual choice and not a joint household decision. Also, retirement is seen a discrete decision (to work or not work) and a permanent one. This seems particularly appropriate for individuals in defined benefit pension schemes where there is little incentive to reduce hours (since pension depends on final salary) and individuals cannot continue to build up their pension once they have left their employer. This way of modeling retirement may be less well-suited to those with defined contribution plans which offer considerably greater

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[45] Burtless (1986) estimates the age of retirement as a function of a non-linear budge constraint – the changes in social security wealth from working one more year at different ages.

flexibility. Finally, since the model is concerned with the effect of pension incentives on labour market participation, retirement is synonymous with drawing a pension. Since the abolition of the earnings test in the UK (see chapter 6), this is not the case with the state pension. But, until recent legislation, individuals were prohibited from continuing to be employed by an employer they drew a pension from, so, again, this is not an unrealistic characterization of the situation in the UK for most men.

In the original option value model, the value of retirement in period r is defined as the (discounted) sum of utility associated with labour earnings (Y_s) up to retirement and the (discounted) sum of utility associated with pension income (B_s) from retirement until (known) death in period S, i.e.:

$$V_t(r) = \sum_{s=t}^{r-1} \delta^{s-t} U_w(Y_s) + \sum_{s=r}^{S} \delta^{s-t} U_r(B_s(r))$$

$$U_w(Y_s) = Y_s^{\gamma} + \omega_s \quad where\ \omega_s = \rho\omega_{s-1} + \varepsilon_{\omega s}$$

$$U_r(B_s) = (kB_s)^{\gamma} + \xi_s \quad where\ \xi_s = \rho\xi_{s-1} + \varepsilon_{\xi s}$$

where γ is the coefficient of constant relative risk aversion, $k \geq 1$ captures disutility of work and ω_s, ξ_s are random individual effects, assumed to follow an AR(1) process, reflecting individual preferences for work/leisure, health or unobserved wealth.

The individual is assumed to compare the expected present discounted value of retirement today with the maximum of the expected values from all possible future retirement dates. The optimum age of retirement r* is that associated with

the maximum value from retirement. An individual will carry on working if there is a gain to postponing retirement, i.e.

$$G_t(r^*) = E_t V_t(r^*) - E_t V_t(t) > 0$$

Assuming that the discount rate is independent of earnings and error terms, the gain from postponing retirement to period r is defined as follows:

$$G_t(r) = \sum_{s=t}^{r-1} \delta^{s-t} E_t Y_s^{\gamma} + \sum_{s=r}^{S} \delta^{s-t} E_t (kB_s(r))^{\gamma} - \sum_{s=t}^{S} \delta^{s-t} E_t (kB_s(t))^{\gamma} + E_t \sum_{s=t}^{r-1} \delta^{s-t} (\omega_s - \xi_s)$$

In other words, it is equal to the expected present discounted value of utility from future earnings from working up to r, together with the expected present discounted value from the change in pension wealth by delaying receipt until r, plus the expected present discounted value of the difference in the random components of utility, a heteroskedastic error term that increases in value, the further r is in the future.

Practically, this can be estimated relatively simply via a probit model in which observed (binary) retirement decisions are estimated as a function of the option value from delaying retirement, assuming values of γ, k and δ and assuming that the random components of $G_t(r)$ are all equal to zero:

$$\Pr[retire\ in\ t] = \Pr[\beta_o + \beta_1 \hat{G}_t(r^*) + \varepsilon > 0]$$

This is the approach taken here.

The option value approach captures the full, financial incentives associated with

retirement at different ages, but empirically is dominated by future earnings. This is potentially problematic for (at least) two reasons. First, there may be considerable uncertainty over an individual's future earnings, particularly at older ages. Given the increasing selection of workers into employment at older ages, it may be hard to get unbiased estimates of individuals' genuine wage opportunities. While pension accrual is also dependent on future earnings, it will not be so sensitive to alternative assumptions about the profile of future earnings. Secondly, earnings may capture individual heterogeneity, which may also affect retirement decision – for example, high wage individuals may have a taste for work. Of course, in principle, it is possible to control separately for earnings, but this may be hard in practice since earnings enter the option value in a highly non-linear fashion.

To avoid the dominance by earnings, Coile and Gruber (2000, 2007) proposed an alternative measure to the option value – the peak value, which is equal to the difference between the level of pension wealth that someone has today and the maximum level of pension wealth that they could get by delaying retirement. This is intended to provide a measure that reflects forward-looking pension incentives, but is not primarily driven by future earnings.

The peak value is derived from the option value in the following way. Making the assumptions that there is no disutility from work and that the coefficient of relative risk aversion is equal to one i.e. $\gamma = k = 1$ (and no random error component), the option value from delaying retirement can be written as:

$$G_t(r^*) = \sum_{s=t}^{r-1} \delta^{s-t} E_t Y_s + \sum_{s=r}^{S} \delta^{s-t} E_t B_s(r^*) - \sum_{s=t}^{S} \delta^{s-t} E_t B_s(t)$$

which is equal to the expected present discounted value of future earnings from working up to r* and the expected present discounted value of the change in pension wealth by delaying pension receipt until r*. Under the assumptions set out above, the value function becomes a 'revenue function'. Defining r* purely in terms of the age that gives the greatest discounted value of pension benefits, the peak value is then equal to this second term. Empirically, as with option value model, the effect on retirement of the peak value can be simply estimated using a probit model.

Using the peak value avoids the potential problems associated with the dominance of earnings in defining incentives, and gives potentially greater bite to pension incentives. However, by ignoring earnings, it may understate the full effect of financial incentives. Also, the units of the peak value are income, not the utility associated with income and this may underestimate the utility associated with greater leisure in retirement, as well as ignoring diminishing marginal utility from additional income. Coile and Gruber (2007) neatly summarize the pros and cons of using the peak value in the following way – the option value is a richer specification that, if correct, should more accurately reflect the underlying incentives in the retirement decision. But, if the specification is wrong, the peak value may give a better approximation.

The main alternative approach to the option value model that can accommodate the non-linear incentives in many pension schemes, is the dynamic programming

model (see, for example, Rust, 1987, French, 2005). Here, the individual is assumed to optimize utility jointly over retirement and income/consumption[46] subject to expected income from employment and pensions associated with alternative retirement dates.

In a two-period setting, the option value model and the dynamic programming model yield the same solution, i.e. work in period 1 if the expected value associated with retirement is less than the expected present discounted value associated with retirement tomorrow. In a three-plus period setting, however, the dynamic programming model solves for the expected value of the maximum of the present discounted values of retiring in different periods, rather than the maximum of the expected values. Since the expected value of the maximum of a random variable is greater than the maximum of the expected value, the dynamic programming model will tend to give rise to relatively greater incentives to delay retirement. These differences may be particularly important where there is considerable uncertainty over future pension values, such as with defined contribution schemes.

While theoretically correct, there is no a priori reason for thinking that the dynamic programming model more closely reflects how individuals actually solve for their optimal retirement age. It is therefore an empirical issue which model best captures actual decision-making. In a test of the two models, Lumsdaine et al (1990), found that the option value model performed well against a dynamic

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[46] There is typically no saving.

programming model[47] in capturing individual responses to an early retirement window in an employer's defined benefit pension. However, the two approaches would need to be compared across a much larger range of incentive schemes for their relative performance to be properly assessed. Moreover, the dynamic programming model estimated by Lumsdaine et al (1990) was a relatively simple one compared to those adopted by Rust (1987) and French (2005). Nevertheless, the comparison study suggests that the option value model does a reasonable job against the dynamic programming model at capturing the effect of pension incentives on retirement behaviour. The fact that it is computationally much simpler makes it relatively attractive to adopt in practice.

4.2 Constructing pension incentive measures

The main data used for analysing retirement behaviour in this chapter are drawn from the UK Retirement Survey (see discussion in chapter 2 for further information on this survey). Among available surveys in the UK, this offers a relatively large sample of people in the relevant age range and rich demographic, economic and health information on individuals and their spouses in both waves. And it has employment history information and pension history information dating right back to individuals' first jobs. However, the survey does not collect earnings history information which is needed to calculate exact pension entitlements for each individual. Instead, as described below (see Box 4) earnings profiles from cross-section surveys are matched on the basis of cohort, education

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[47] In practice, there are several dynamic programming models corresponding to alternative specifications of the error terms.

and industry. Another drawback of the survey is that individuals are not asked to provide detailed information on the rules of their employers' pension (if they belong to one). Some information is available on eg the normal retirement age. But, other aspects of the scheme rules, such as accrual rates, are unavailable and are imputed according to the rules of the most common scheme in the sector in which the individual works. A final drawback is that there is no way of knowing if individuals were offered particular early retirement windows.

The analysis of retirement behaviour is based on a sub-sample of people in the Retirement Survey. The group comprises those who were:

- below the state pension age in Wave 1, ie men aged 55-64 or women aged 55-59 in 1988/9;
- working in Wave 1 with non-missing earnings information and no income from occupational pension schemes/unemployment benefit/income support; and
- interviewed in both waves.

Excluding people who fail to meet any one of these criteria leaves 456 individuals – 283 men and 173 women. Each of these individuals remains in the sample from 1989 until they leave employment, leaving a total sample of 1,998 person observations. Summary sample characteristics, based on all person-observations are given in Table 4.1.

Table 4.1

Sample Characteristics

	Men	Women
Number of person observations	1276	722
Mean age	61.50	59.87
Proportion currently married	0.8659	0.7659
Age difference between individual and spouse (years)	2.80	1.17
Net earnings ($)	18570	9064
Proportion with an occupational pension	0.6857	0.3850
Proportion of women paying reduced rate NI	0.0000	0.7410
Length of time in current job (years)	12.16	9.85
Proportion of time in FT employment	0.6143	0.2341
Industry = energy	0.0940	0.0000
Industry = engineering	0.0030	0.0457
Industry = manufacturing	0.2014	0.1191
Industry = distribution	0.1951	0.1551
Industry = services	0.2429	0.6053
Industry = government	0.0635	0.0748
Zero financial wealth	0.1897	0.1856
£1 - £3000 financial wealth	0.4036	0.4460
£3000 - £10000 financial wealth	0.2045	0.1717
>£10000 financial wealth	0.1575	0.1399
Missing financial wealth	0.0447	0.0568
No qualifications	0.4397	0.6108
School qualifications	0.4287	0.3047
College	0.1317	0.0845
Health in 1988 (severity score)	0.3017	0.3670

Variable definitions

Severity score = measure of self-assessed health status based on the international classification of impairments, disabilities and handicaps (ICDIH). Separate scales are constructed for areas of locomotion, reaching and stretching, dexterity, seeing, hearing, continence, communication, personal care, behaviour, intellectual functioning, consciousness, digestion and disfigurement. The severity score is constructed as a weighted average of the three highest severity scores from the 13 areas: Highest + 0.4(second highest) + 0.3(third highest).

There are several different elements to the financial retirement incentives facing the cohort of individuals in the Retirement Survey (see also Box 1 in chapter 1 for an overview of the UK pension system). Table 4.2 summarises labour market participation and income receipt by age using data from the Family Expenditure Survey 1994-5 (corresponding to the second wave of the Retirement Survey). It shows relatively high rates of labour market withdrawal among men before eligibility for state pensions (the basic state pension and the state earnings-related pension scheme, SERPS), which are payable from age 65 for men and age 60 for women. Before this age, private pensions (typically from former employers), disability benefits and other benefits (unemployment benefits and income support) provide alternative early retirement vehicles. It is important to stress that private pensions and disability benefits are not always alternative pre-retirement income sources, but are often received together by the same people. The fact that disability benefit was not means-tested prior to April 2001 meant that it could be received in conjunction with other forms of income. Three-quarters of people in receipt of disability benefit income also received some money from a private pension.

Table 4.2

Labour Market Participation and Income Receipt

	Not in work	State pension	Private pension	Disab benefits	Dis + Private	Other benefits
Men						
50-54	0.150	0.000	0.094	0.073	0.023	0.065
55-59	0.359	0.000	0.343	0.138	0.082	0.072
60-64	0.553	0.000	0.539	0.209	0.147	0.123
65-69	0.897	0.812	0.741	0.166	0.131	0.053
Women						
50-54	0.290	0.050	0.104	0.040	0.013	0.048
55-59	0.467	0.097	0.198	0.039	0.006	0.052
60-64	0.769	0.797	0.360	0.024	0.015	0.048
65-69	0.915	0.959	0.412	0.000	0.000	0.046

Source: Family Expenditure Survey 1994-5

The approach to constructing these various elements of the pension system (broadly defined) for each individual in the Retirement Survey is discussed below. Potential sources of variation in total pension wealth and accrual rates are highlighted since these are crucial for identifying the impact of pension incentives on retirement behaviour in practice.

The basic state pension

The basic state pension is a flat rate pension paid to men from age 65 and women from age 60 who have made sufficient contributions over their working lifetimes.

Since 1989, receipt has not been subject to any earnings test (see chapter 6). As shown in Table 4.1., most women in the Retirement Survey cohort chose to pay the reduced rate of married women's national insurance contributions and will therefore receive no state pension in their own right, but only be eligible for an addition to their husband's pension.

Calculation of basic state pension entitlement is straightforward. It depends on the total number of years' contributions and, for a married woman, on whether she opted to pay reduced rate National Insurance contributions. This latter piece of information is known directly from the Retirement Survey. Although the basic state pension is flat rate, total wealth will vary across individuals because of the dependant's allowance and because of the fact that widows not entitled to a pension in their own right can claim their former spouse's pension in full when their spouse dies. In these cases, husbands' total pension wealth needs to be computed over the life of the couple, based on the age difference between the spouses. Obviously, the larger the age difference between husband and wife, the greater the husband's total pension wealth.

The State Earnings Related Pension Scheme (SERPS)

The state earnings-related pension scheme (SERPS) was introduced in 1978 and at the time, was intended to pay a pension worth one-quarter of an individual's best

twenty years of earnings.[48] However, the majority of people in the Retirement Survey cohort were not eligible for SERPS. For women, this was because they had given up their right to a state pension at all; for around two-thirds of men, it was because they belonged to an occupational pension and contracted out of SERPS. Only a minority of people in the sample of retirees remained in SERPS, although they form an interesting group to look at since SERPS was nearing its peak in terms of generosity at the time they were retiring.

The precise formula for calculating an individual's SERPS pension is given by:

$$SERPS = \sum_{t=1978}^{R} \chi_{Rt}\left(\tilde{W}\frac{Y_R}{Y_t} - LEL_{R-1}\right) \quad \text{where} \quad \tilde{W} = \max(W_t, UEL_t)$$

Earnings up to an annual upper earnings limit (UEL) are re-valued to the year of reaching state pension age (R) using an index of economy-wide average earnings (Y_R/Y_t). The lower earnings limit (LEL) in the year prior to the individual reaching state pension age is deducted from each year's re-valued earnings and the net of LEL earnings are multiplied by an accrual factor ($?_{Rt}$).[49] For people retiring

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[48] Its generosity was reduced by subsequent reforms and, in 2004, SERPS was replaced by the state second pension (S2P), which is eventually to become a flat-rate top-up to the basic state pension.

[49] This formula changed from fom April 2000. Instead of uprating annual earnings and then subtracting the LEL from the year prior to retirement, the lower earnings limit from the year worked is subtracted from earnings first and then the difference is uprated in line with earnings growth. Since the LEL is annually uprated in line with the Basic State Pension, ie with prices, this has the effect of reducing the generosity of SERPS.

before 2000 the accrual rate was 1.25% a year. Given individual earnings profiles (see Box 4) SERPS entitlements are fairly straightforward to calculate. People who are in occupational pension schemes and married women who have opted to pay reduced rate National Insurance contributions are assumed to have zero SERPS entitlement.

There are several potential sources of variation in SERPS pension wealth across individuals. Total wealth, but not accrual, will be affected by an individual's employment history since 1978 - both the number of years they have been in employment and their earnings - while projected earnings in the future will have an impact on expected total wealth and accrual. Another important factor for determining total wealth (but not accrual) will be the individual's age in 1978; this was when SERPS was introduced. The maximum SERPS pension to which an individual could be entitled, for each year of retirement since 1978 is shown in figure 4.2. (and also the SERPS entitlement based on average earnings). For example, someone reaching state pension age in 1979 would receive practically no SERPS pension since they would only have been building up entitlement for one year.[50] Someone retiring in 1998 could have accrued rights to a SERPS pension of up to £5,000 a year by earning the upper earnings limit for 20 years.[51] Finally, the fact that widows can claim their former husbands' SERPS pensions if they receive no pension in their own right means that, as with the basic state

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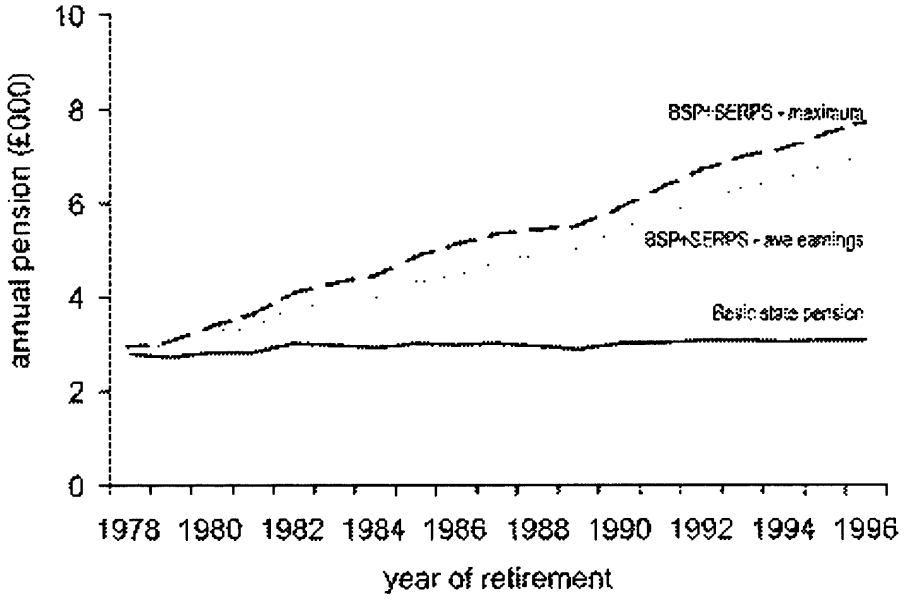
[50] Individuals cease to build up entitlements once they pass the state pension age.

[51] Accrual rates will change after 2000, but this reform will not affect the cohort of individuals in the Retirement Survey all of whom will have reached the state pension age before then.

pension, a man's marital status, and the age difference between them and their spouse also affects their total pension wealth and accrual.

Figure 4.2

Entitlement to SERPS



Where individuals had retired by the second wave and report pension receipt, their estimated SERPS pension can be compared with the actual SERPS pension they received. The correlation coefficient is positive and significant, but is fairly low (0.3334) compared to that for occupational pensions (see below). On average, estimated SERPS pensions (£2,406) are lower than actual pensions received (£2,697). One possible explanation for the low correlation is that individuals who are in SERPS – and not therefore in occupational pension schemes - are likely to have had more variable employment histories than those who are in occupational schemes. The method for estimating earnings profiles may be missing a lot of

variation in their previous earnings, which would also matter more for SERPS than for occupational pensions which are typically determined only according to recent years' earnings.

Means-tested benefits and disability benefits

In addition to the basic state pension and SERPS, there are two other state benefits that are taken up widely by older non-workers – means-tested income support and disability benefits (incapacity benefit, formerly invalidity benefit). Income support is a flat rate, non-contributory means-tested benefit, paid automatically to people aged 60 or more who do not work. Unlike people in younger age groups, the over-60s do not have to show that they are actively seeking work in order to qualify. In the analysis, income support is ignored since it is universal.

Incapacity benefit (formerly invalidity benefit) is a contributory benefit paid to the long-term sick and disabled. Receipt is conditional on medical certificates from an individual's own doctor (in the case of invalidity benefit) or on being assessed on an 'all work test' by a doctor employed by the Benefits Agency Medical Service (in the case of incapacity benefit).

Box 4 Imputing earnings histories

Earnings histories are absent in the Retirement Survey. But the survey does provide detailed work histories documenting spells in employment, whether the employment was part-time or full-time and in which industry the individual worked, which, together with information on age and education, allow us to match earnings profiles from cross-section data. There is no single dataset with consistent information on these variables going back to 1978. Instead, we combine information from two datasets to get consecutive cross-section waves of data from 1978-89 – the Family Expenditure Survey (1978-86) and the General Household Survey (1987-9). Projecting forward from 1989 we assume constant real wages.

We also exploit the earnings information that is available in the first wave of the Retirement Survey to construct an individual fixed effect, which we use to adjust the individual's entire earnings profile. We assume that the wage of individual i in cohort/education/industry sub-group g in period t can be expressed as

$$W_{igt} . \ ?_i W_{gt}$$

where $?i$ is a constant individual fixed effect, *Wig88/Wg88*, where *Wig88* is taken from the Retirement Survey and *Wg88* is calculated from the cross-section data. Our underlying assumption is that macro shocks affect everyone in the cohort/education/industry sub-group in the same way and there are no idiosyncratic shocks changing the ordering of individuals of the same cohort in the income distribution.

One possible way to treat entitlement to invalidity benefit would be to assume that only individuals who received the benefit were eligible, and that only those who satisfied the eligibility conditions received the benefit. However, this assumption seems inappropriate given the fourfold increase in the number of people receiving invalidity benefit between 1980 and 1994, which is unlikely to reflect such a big increase in underlying levels of disability. The alternative approach taken here is to calculate an individual's invalidity benefit wealth on the basis of an assigned probability that they will receive the benefit. These probabilities are derived from estimating a probit model for receipt of invalidity benefit as a function of characteristics such as age, education, region, tenure, marital status and spouse's employment status using data drawn from the Family Expenditure Survey from April 1988 to March 1994. Probabilities for individuals in the Retirement Survey are imputed on the basis of matched characteristics. The probit results are reported in the Annex to this chapter.

Private pensions

Compared to most other European countries the United Kingdom has a high level of coverage of private pensions, including both occupational pensions and individual retirement accounts (personal pensions). For the cohort of retirees in the Retirement Survey, defined benefit occupational pensions dominate private pension incentives – and are likely to be more important than state pensions in determining retirement for those who belong to such schemes. Nearly 70% of men and 40% of women in the sub-sample analysed here had an employer pension (see Table 4.1). Coverage of individual DC plans was much lower among this cohort (see Table 1.4 in chapter 1) and these pensions are excluded from the

analysis in this chapter, not least because the survey contains very little information on the value of wealth held in defined contribution schemes that would allow any reasonable estimates of wealth and accrual effects for this type of scheme. Excluding DC schemes will mean mis-measurement of pension wealth for some individuals, but the effects of this should be relatively small few people. Table 1.4 suggests that among the cohort of men born 1920-29, which includes most in the Retirement Survey, approximately 15% had a personal pension, although this had increased to more than 30% among the cohort born 1930-39. However, many of these are likely to be self-employed, and will have been excluded from the sub-sample analyzed here. Moreover, among the employed, levels of pension wealth held in personal pensions are likely to be fairly small since individuals would only have been able to contract out of the state system into such schemes from 1988 onwards.

The pension received in a defined benefit occupational pension scheme (P) is typically determined by a formula of the type:

$$P_R = N_R \phi (PE_R - \beta LEL_{R-1})$$

where f is the scheme-specific accrual rate, PE_R is 'pensionable earnings' at the time of retirement, typically the individual's average earnings in the last year, or last few years, before retirement, β is the 'integration factor' (zero or one), LEL is the lower earnings limit in the Nation Insurance system, and N is the number of years that the individual has belonged to the scheme at the time of retirement. N is known from information in the Retirement Survey, where respondents are asked

how long they have belonged to their occupational pension scheme. However, the other parameters, f, β and the choice of pensionable earnings have to be assigned.

The main distinction in assigned accrual rates, pensionable earnings and integration factors is between those working in the private sector and those in the public sector. Based on the responses in the government's 1991 survey of occupational pensions, it is assumed that individuals in the private sector face an accrual rate of $1/60^{th}$ and an integration factor of 1 and a definition of pensionable earnings that takes the best three out of the last ten years' earnings. For individuals in the public sector, it is assumed that they face an accrual rate of $1/80^{th}$ and an integration factor of 0, and that pensionable earnings are taken as the best year's earnings out of the last ten years.

Comparing the estimates of individuals' occupational pension income with the actual occupational pension they received (where this information is available, ie for individuals who had retired by the second wave of the Retirement Survey and reported pension receipt), the correlation coefficient is positive, significant and high (0.7868). As with SERPS, however, the average amount received is under-estimated (5,088 compared to an actual average annual pension of 4,841)

By construction total occupational pension wealth – and accrual rates – will vary across individuals according to whether they work in the public or private sector. But there are other sources of variation in both total wealth and accrual rates. Total wealth will vary according to the number of years that the individual has belonged to the scheme, while projected earnings in the future will have an impact on expected total wealth and accrual.

Further variation in accrual rates comes from differences across occupational schemes in the normal retirement age – defined by Inland Revenue as the age members can start drawing a pension with no reduction for early payment.[52] We assume that people can continue to accrue rights to occupational pensions beyond this age (up to a maximum of forty years), but for each year that they continue to work beyond this age they lose a year's pension.

As shown in Figure 4.3, there has been a gradual fall in normal retirement ages among private sector scheme members since 1971 (almost all public sector scheme members have a normal retirement age of 60) and an increasing proportion with a normal retirement age of 60. In part, this may reflect the growth in female employees who belong to occupational pensions,[53] but even among men, the proportion with a normal retirement age of 65 fell from 87% in 1971 to 68% in 1991.

The trend towards early retirement may partly be explained by the increasing number with a normal retirement age below 65. But, a complete picture of the incentives to retire early would also have to take account of schemes' provision for early retirement due to ill-health or on other grounds. As shown in Table 4.3. provision for early retirement on the grounds of ill-health became more generous

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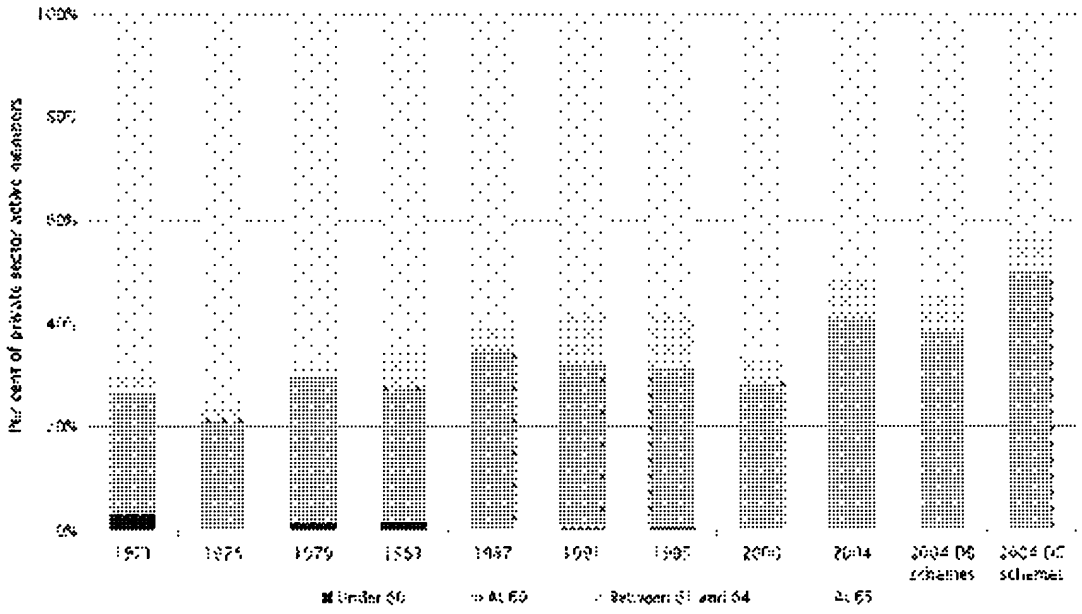
[52] The survey asks 'At what age will you start to receive the pension' and then asks 'is that the usual age for drawing a pension', which it is for 90% of respondents. Where information on usual pension age is missing, we assume that it is 65 (the modal age).

[53] Since the Barber ruling of 1990, schemes must have the same normal retirement age for men and women.

during the 1970s and 1980s; by 1991 more than half of members in private sector schemes would be given an enhancement to the pension they had accrued up to the point of retirement.

Figure 4.3

Normal retirement ages, private sector scheme members



Source: Government Actuary's Department, Survey of occupational pension schemes, 2004

Table 4.3

Provision for retirement on grounds of ill-health, private schemes

	1971	1975	1979	1983	1987	1991	2000
Better than accrued	15%	38%	46%	45%	47%	54%	43%
Accrued only	28%	28%	33%	22%	13%	6%	20%
Less than accrued	57%	34%	21%	28%	23%	14%	
Health insurance				5%	14%	15%	7%
Money purchase					3%	11%	14%
Other							26%

"Better than accrued" means that individuals are given an enhancement to the pension they have accrued, sometimes up to the amount they would have received if they had worked up to the normal retirement age. "Accrued only" means that individuals receive the pension they have accrued with no reduction for early retirement. "Less than accrued" means that individuals receive a smaller annual pension than they have accrued to take account of earlier retirement.

The figures for 2000 are not directly comparable with those from previous years because of the high proportion of other (typically offering different combinations of the other options).

Source: Government Actuary's Department, Survey of occupational pension schemes, various years

The government actuary department's (GAD) surveys of occupational schemes also revealed widespread (and varied) provision for early retirement, other than on grounds of ill-health. In 1987, for example, the option to retire early was available to 95% members; in 12% of cases at the member's initiative, 22% at the employer's initiative and 65% at either. In most cases, early retirement was possible from age 50. The details of provisions for early retirement are not formally documented in the GAD surveys, but include paying a pension based on accrued service with a reduction factor (often actuarially favourable), applying a reduction factor to a pension based on full potential service to the normal retirement age and immediate retirement based on accrued pension with no reduction.

The Retirement Survey does not contain any information about what provision is made for early retirement in the scheme that the respondent belongs to, and we make no additional assumptions about what early retirement benefits the scheme might provide. Thus what is modeled is wealth and accrual under a stylized version of the individual's standard scheme, with no provision for early retirement. This almost certainly fails to capture the actual set of retirement incentives facing some individuals, and in particular, will tend to under-estimate the incentives to retire early. With this important caveat in mind, we present estimates of total pension wealth and the forward-looking peak value for individuals in the Retirement Survey and then estimate the effect of pension incentive measures on the timing of retirement.

Total Pension Wealth and Accrual Measures

Estimates of total pension wealth and peak values are presented in table 4.4 for men, separately for those with and without an occupational pension. Peak values are shown since they are easier to interpret than option values, which are expressed in utility terms. In practice, option values typically remain positive, even up to age 70. Partly, this reflects typically low replacement rates in the UK, but it is also driven by the assumption that earnings remain constant in real terms indefinitely, which may be unrealistic. While individual wage profiles derived from panel data show no or little decline in real wages, there is a high degree of selection, which needs to be taken into account. A better understanding of the true wage opportunities for older workers is an important area for future research, but beyond the scope of this thesis.

Table 4.4

Estimated pension wealth and peak values (£, 1998), men only

	No occupational pension		With occupational pension	
Age	Mean wealth	Mean peak value	Mean wealth	Mean peak value
57	51,873	4,545	69,724	14,764
58	54,387	3,998	75,962	12,235
59	57,654	3,683	77,299	9,329
60	61,190	3,456	80,684	8,051
61	64,905	2,937	81,289	6,398
62	65,499	2,039	83,265	4,644
63	70,097	1,050	88,741	2,644
64	71,905	1,195	87,824	3,139
65	70,723	-5,403	89,018	-3,312
66	58,099	-5,106	74,862	-3,307
67	45,886	-4,854	56,872	-3,819
68	32,430	-4,563	49,784	-4,568
69	21,808	-4,546	26,064	-4,869
70	15,283	-4,282	17,506	-5,634

The values for wealth and peak value in table 4.4 do not represent true age profiles since the mean values are calculated across an unbalanced panel. In other words, the sample of men observed at age 58 is not the same as the sample of men observed at age 59, and so on. The age profile will be affected by cohort effects (the older men in the sample are drawn from a different cohort to the younger ones), as well as by the increasing selection of individuals as retirements increase

with age. Nevertheless, the values give some indication of the magnitude of wealth and accrual values at different ages, and of the difference between men with and without an occupational pension. Those with occupational pensions tend to have higher peak values, at least up to the state pension age – and higher wealth. These incentives could work in either direction towards earlier retirement (through higher wealth values) or later retirement (through higher peak values). The observed pattern of exits suggests that the effect of the higher peak values is likely to dominate at least at younger ages, encouraging men with occupational pensions to stay in employment. It is worth pointing out that although the typical annual occupational pension is considerably higher than the typical SERPS pension, the difference between total pension wealth for people with occupational pensions and those without is reduced by the more generous survivors' benefit provisions of SERPS. In the case of SERPS, the surviving spouse inherits the pension in full; in the case of occupational pensions, they inherit only half.[54]

4.3 Estimating the effect of pension incentives on retirement

The effects of pension incentives on retirement are estimated by means of a probit model. As described in section 4.1. above, this is equivalent to estimating the option value model, assuming particular values for the parameters k (set = 1.5), γ

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[54] The survivors' benefit was due to be cut to half in SERPS from April 2001. However, in the run up to the pre-announced reform many people were issued the wrong information in the form of leaflets that did not refer to the reform. The change was delayed to October 2002 and those who can show that they were mis-informed will keep their original entitlement.

(set = 0.75) and β (set = 0.97) and assuming that the random error component is equal to zero.

For each individual *i*, we define D_{it} = 1 if the individual has left the labour market in period t (conditional on being in the labour market in period t-1). The probability of this event is then modelled as a function of observable household and individual characteristics as well as the pension incentive variables. Denoting the observable characteristics as Z_{it}, and the pension incentive variables as I_{it}, the conditional probability model may be expressed as:

$$\Pr(D_{it} = 1) = G(a'Z_{it} + bI_{it})$$

where G is the cumulative distribution function of unobservables in the conditional exit model, assumed to be normal, and a and b are unknown coefficients, estimated using a probit, pooling all five years of retirement information.

We estimate different specifications using alternative pension incentive variables. Because the option value model may be empirically dominated by future earnings, we try a measure of peak value and we also try the single-period accrual to see how it compares. In each case, we also include a measure of discounted total pension wealth for the individual, accrued up to period t-1, plus the same variable for the spouse, to take account of the fact that higher levels of wealth are likely to cause the individual to retire earlier, independently of the effect of possible additions to that wealth from staying in work. We also include a measure of financial wealth and housing tenure, proxying for housing wealth.

In order to identify the effects of incentive measures on retirement behaviour, these measures must vary across individuals and/or over time conditional on the other socio-demographic covariates that would be included in a model of retirement. As the previous discussion of the construction of the pension incentive measures has shown, there are several potential sources of variation in total wealth and in the forward-looking accrual measures for each of the four separate elements of the pension system (summarized in Table 4.5). Almost all of the sources of variation affect both total pension wealth and accrual. However, future earnings will affect forward-looking accrual measures but not current total pension wealth, while total wealth (but not accrual) varies with past earnings and with the individual's date-of-birth (in the case of individuals with SERPS).

Table 4.5

Sources of variation in pension incentives across individuals

		Wealth	Accrual
Marital status and age of spouse	BSP, SERPS, OP	✓	✓
Whether spouse paid reduced rate NI	BSP, SERPS	✓	✓
Past earnings	SERPS, OP	✓	
Future earnings	SERPS, OP		✓
Date of birth	SERPS	✓	
Number of years with current employer	OP	✓	✓
Accrual rate	SERPS, OP	✓	✓
Pensionable earnings	OP	✓	✓
Normal retirement age	OP	✓	✓
Region, tenure, spouse's employment, education, age	IVB	✓	✓
BSP = basic state pension; SERPS = state earnings-related pension scheme; OP = occupational pension; IVB = invalidity benefit			

Simple OLS regressions of the pension wealth and accrual measures on the full set of control variables confirm that there is independent variability in the pension measures. The results, reported in Table A4.2 in the Annex to this chapter, show that nearly 40% of total pension wealth remains unexplained by all the other included regressors, including option values. For the option value, 24% of the variation remains unexplained by the other regressors, including total pension wealth. For peak value, the proportion is more than 50%.

Turning to the conditional exit probability estimates, Table 4.6 presents the marginal effects and standard errors from a Probit regression for three specifications estimated using data on the sample of men in the Retirement Survey. The columns vary according to the specification of age effects. In the first column, a linear age term is allowed. If all other age effects are due to wealth

and incentive effects, this specification would be adequate. However, given that the survey mixes different cohorts and that age may reflect preferences as well as incentives, the second column includes a set of dummies for single year date-of-birth cohorts. The final column includes a full set of age dummies.

When a full set of age dummies is included, the accrual effects are typically insignificant. Including a full set of age dummies risks "over-fitting" the data and removing the effect of pension incentive measures on retirement, where these are strongly related to age. In the discussion below, we therefore focus on the results with linear age and cohort dummies rather than those with the full set of age dummies. However, given the limited information available in the Retirement Survey, the pension measures may fail to pick up the full incentive effects (discussed further below). In an attempt to balance the two concerns, panel (b) shows the results including a dummy variable for age at which individuals become eligible to receive a pension. For recipients of the basic state pension and SERPS this is the normal state pension age, 65 for men and 60 for women. For individuals with an occupational pension we use the age at which they are entitled to start drawing their occupational pension. Because the eligible age varies across individuals in occupational pension schemes, it has potential explanatory power even when added to the specification with the full set of age dummies in the final column.

Table 4.6

Effect of pension incentives on the probability of retirement

	Linear age		Cohort dummies		Age dummies	
(a) Excluding age first eligible to draw pension						
Total wealth	0.1599	0.0293**	0.1854	0.0316**	0.1464	0.0315**
Single period accrual	-0.7960	0.2520**	-1.4225	0.2422**	-0.2002	0.2819
Spouse wealth	0.0324	0.0154**	0.0386	0.0165**	0.0306	0.0159*
Log likelihood	-404.12		-407.94		-384.43	
Total wealth	0.1413	0.0278**	0.1599	0.0308**	0.1428	0.0308**
Peak value	-0.1515	0.1273	-0.5073	0.1248**	-0.0412	0.1219
Spouse wealth	0.0269	0.0153*	0.0298	0.0166*	0.0293	0.0158*
Log likelihood	-408.89		-418.72		-384.63	
Total wealth	0.1242	0.0328**	0.0816	0.0330**	0.1200	0.0341**
Option value	-0.5790	0.6714	-2.8157	0.5880**	-0.9824	0.7140
Spouse wealth	0.0245	0.0154	0.0188	0.0165	0.0267	0.0158*
Log likelihood	-409.25		-415.68		-383.72	
(b) Including age first eligible to draw pension						
Total wealth	0.1119	0.0301**	0.1378	0.0329**	0.1321	0.0322**
Single period accrual	-0.3126	0.2599	-1.0185	0.2529**	-0.1831	0.2832
Spouse wealth	0.0224	0.0155	0.0281	0.0167*	0.0279	0.0158*
Eligible age	0.1788	0.0454**	0.1586	0.0456**	0.0961	0.0635*
Log likelihood	-390.34		-397.77		-382.72	
Total wealth	0.1007	0.0286**	0.1114	0.0318**	0.1284	0.0316**
Peak value	-0.0136	0.1225	-0.3239	0.1259**	-0.0185	0.1217
Spouse wealth	0.0194	0.0154	0.0199	0.0167	0.0266	0.0157*
Eligible age	0.1992	0.0452**	0.2013	0.0171**	0.0962	0.0637*
Log likelihood	-391.07		-402.78		-382.92	
Total wealth	0.0850	0.0335**	0.0394	0.0333	0.1047	0.0349**
Option value	-0.5983	0.6722	-2.5430	0.5845**	-1.0236	0.7136
Spouse wealth	0.0175	0.0154	0.0105	0.0164	0.0239	0.0158
Eligible age	0.1977	0.0441**	0.2143	0.0465**	0.0995	0.0638*
Log likelihood	-390.68		-396.54			

** denotes significance at the 5% level; * denotes significance at the 10% level.
The single accrual, peak value, option value and total pension wealth measures are in £100,000s.
The set of controls comprises earnings, spouse earnings (and both squared), difference in age between the couple, job tnure, % life spent working full-time, education, health score, housing tenure, industry, wealth and a dummy for occupational pension membership.

The results strongly support an effect of pension incentives on retirement behaviour. In all but two cases, the signs are as would be expected, showing a positive wealth effect (the higher someone's pension wealth, the more likely they are to retire) and a negative accrual effect (the more someone can increase their pension wealth by working, the less likely they are to retire). Since the pension measures are in £100,000, the magnitude of the coefficients in panel (a) indicates that a £50,000 increase in pension wealth would raise the probability of retirement by between four and eight percentage points, depending on the specification. If someone could increase their pension wealth by £10,000 by working for an additional year (i.e. single period accrual), the probability of retiring would fall by between four and seven percentage points. In most cases, the wealth and accrual variables are significant.[55]

The dummy for eligible age is strongly positive and significant. This may capture a number of different effects. It may reflect social norms and the tendency for people to retire at the "retirement age", whether this is the state pension age or the usual retirement age in their firm. Or, it may reflect the presence of liquidity constraints – the fact that people cannot typically borrow against their future pension income may restrict them to retiring only once they are eligible to receive

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[55] The panel nature of the survey means that the standard errors calculated from the standard formula for the Probit model will not account for the dependence across time periods. Blundell et al. (2004), present bootstrap confidence intervals that do allow for this dependence. These intervals maintain the significance in the wealth and incentive variables found in Table 4.6.

a pension income. However, further analysis (reported in Blundell et al, 2004) suggests that this is unlikely. Additional interaction terms equal to total wealth and accrual only after the age of eligibility were found not to be significant, even for the group of people with very low levels of financial wealth. In the UK, the availability of generous means-tested benefits from age 60, typically equivalent to or greater than the value of the state pension for people on low incomes, means that liquidity constraints are not likely to operate in practice. Finally, the dummy for eligible age may pick up retirement incentives that have not been fully incorporated into the pension measures.

Before discussing further the results from the different specifications, there are some other interesting significant coefficients that are worth commenting on (see Table A4.3):

- The effect of spouse pension wealth is also positive, but smaller and less often significant than the individual's own wealth.

- The difference in years between the ages of the couple is negative and significant (ie the younger the wife, relative to the husband, the less likely he is to retire). This may indicate some degree of joint retirement decision-making. A dummy for whether or not the spouse is retired is positive and significant, which may also indicate joint retirement.

- The health score at wave 1 is positive and significant, indicating, not surprisingly, that people in poorer health are more likely to retire.

- A dummy variable for whether or not someone has an occupational

pension is positive and significant. This may indicate a taste for retirement among those who select into jobs with occupational pension schemes or it may pick up retirement incentives not properly captured by the pension measures.

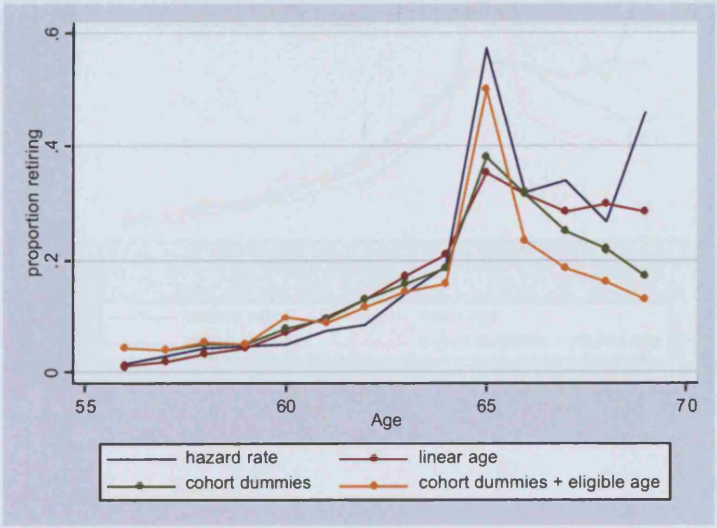
Figure 4.5 is intended to shed further light on the performance of the different regression specifications. It shows how the predictions from regressions including single period accruals, peak values and option values compare with the actual pattern of retirement by age.

All three specifications are fairly good at picking up retirements before age 65. However, without the inclusion of a dummy for age of eligibility, all fail to pick up the size of the spike at age 65. In general, the single period accruals perform surprisingly well against the peak value and option value models. Although single period accrual measures will not capture non-linear incentives, the absence of any information on particular early retirement windows means that most of the pension incentive measures constructed for the Retirement Survey cohort typically evolve in a fairly linear fashion. The single period accrual measure is best able to capture the spike at age 65, which may reflect the fact that the peak value and option value will tend to smooth future accrual over a number of years.

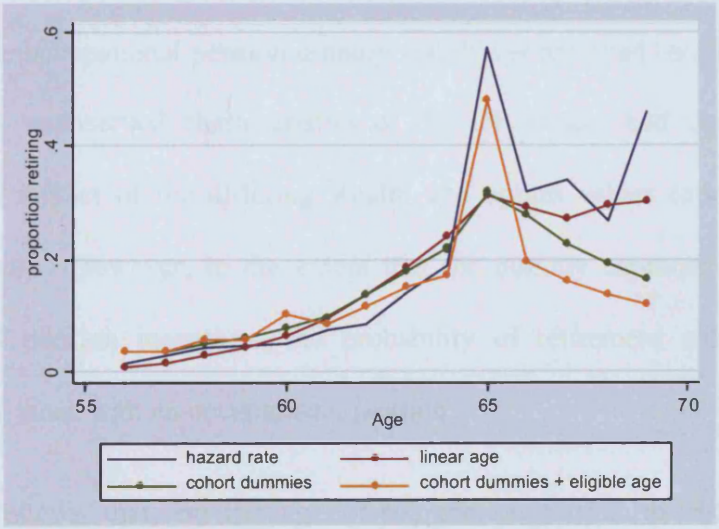
Figure 4.4

Actual and predicted retirement

(a) Single period accruals



(b) Peak value



(c) Option value

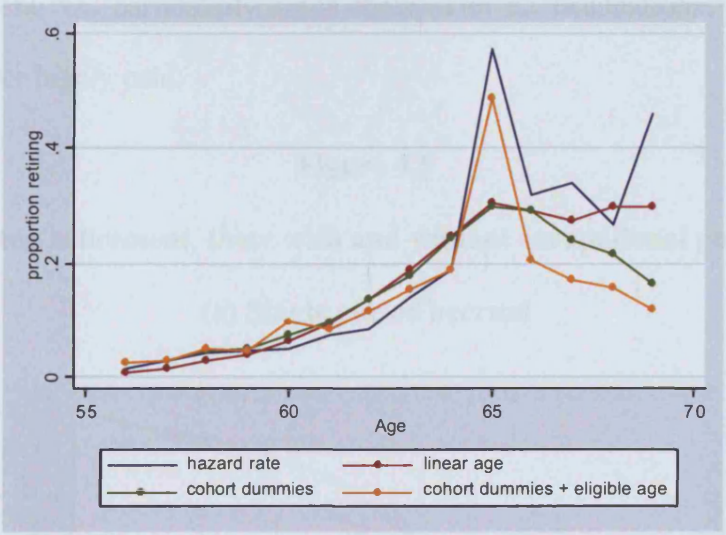


Figure 4.5 compares predicted retirement for those with and without an occupational pension, using each of the three different accrual measures. The impact of the occupational pension dummy variable is removed (on the basis that it represents unobserved characteristics of the OP group) and the figure just captures the impact of the differing wealth and option values (and observable characteristics). However, to the extent that the dummy captures unmeasured occupational pension incentives, the probability of retirement will be under-predicted for those with an occupational pension.

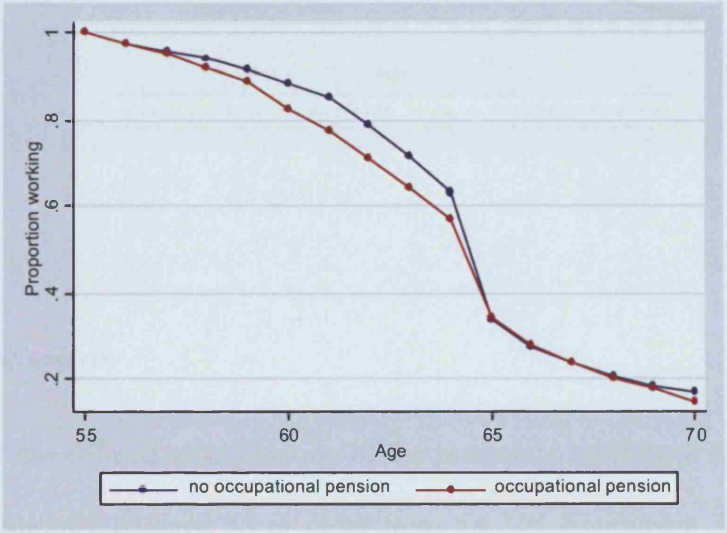
The figure shows that, by the age of 63, the proportion of those with an occupational pension who are still in employment is between three and ten percentage points lower than among those with no occupational pension. Interestingly, the option value specification gives rise to the least difference between the two groups. This is likely to reflect the importance of the earnings

variables in the option values, which may reduce the impact of the differential pension incentives, particularly since those with an occupational pension are typically more highly paid.

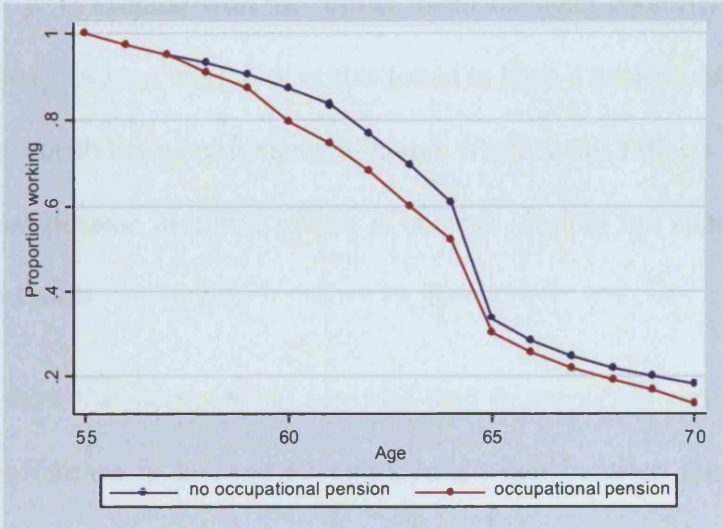
Figure 4.5

Predicted retirement, those with and without occupational pensions

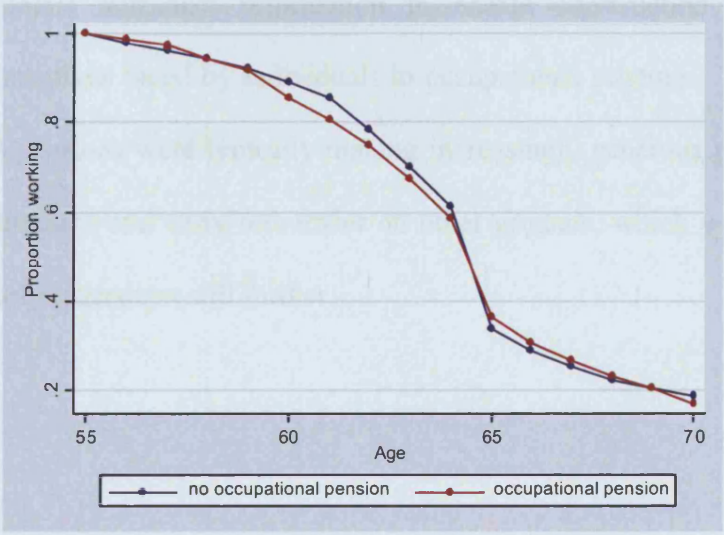
(a) Single period accrual



(b) Peak values



(c) Option values



4.4 Conclusions

This chapter has offered an evaluation of the economic incentives for retirement using a sample of men aged 55 or older from the UK Retirement Survey. The results point to significant wealth and accrual effects on retirement through the pension system, in keeping with the results found for other countries (see Gruber and Wise, 2004). Age of eligibility is also found to have a positive and significant effect on the probability of retirement, although whether this reflects social norms or unmeasured pension incentive effects is unclear. It does not appear to reflect liquidity constraints.

The results show that occupational pensions tend to encourage early retirement. We find a difference in the age 63 employment rate between those with and without an occupational pension of between 3 – 10 percentage points, depending on the specification. Moreover, these results almost certainly understate the

extent to which occupational pensions incentivised early retirement. The survey does not contain sufficient information to enable construction of the full retirement incentives faced by individuals in occupational schemes. At the time, occupational pensions were typically making increasingly generous provision for ill-health retirement and early retirement on other grounds, which would tend to encourage early retirement still further.

Annex 4: Further regression results

Table A4.1

Results of probit regression, invalidity benefit receipt

Dependent variable 1 = receives invalidity benefit

	Men		Women	
	Coeff	SE	Coeff	SE
Yorks & Humberside	-0.0958	0.0748	-0.1601	0.1129
North West	0.0217	0.0713	0.2176	0.0989
East Midlands	-0.4242	0.0857	-0.2936	0.1256
West Midlands	-0.3005	0.0773	-0.3128	0.1155
East Anglia	-0.6051	0.1189	-0.4210	0.1700
South East	-0.5109	0.0835	-0.2288	0.1165
Greater London	-0.5336	0.0731	-0.4302	0.1101
South West	-0.4568	0.0852	-0.3078	0.1253
Wales	0.2494	0.0809	0.3606	0.1088
Scotland	0.0179	0.0743	0.2237	0.0998
Age	0.5859	0.0246	0.4968	0.0354
Age squared	-0.0054	0.0002	-0.0048	0.0003
College education	-0.6891	0.0962	-0.0452	0.1019
Spouse employed	0.1476	0.0416	-0.1923	0.0467
Homeowner with mortgage	0.0109	0.0484	-0.0529	0.0614
Outright owner	-0.0850	0.0399	-0.2829	0.0595
Constant	-15.7892	0.6933	-13.5498	0.9405
Number obs	9,636		14,192	

Source: Data from Family Expenditure Survey, April 1988-March 1994.

Table A4.2

Results of OLS regressions, wealth and accrual

	Wealth		Option value		Peak value	
	Coeff	SE	Coeff	SE	Coeff	SE
Option value	-9.010	.4965*				
Total pension wealth			-0.023	.0013*	0.021	.0067*
Spouse pension wealth	-0.153	.0113*	-0.003	.0006*	0.003	.0032
Net earnings	-0.067	.0073*	0.001	.0004	-0.008	.0020*
Spouse net earnings	-0.008	.0046	-0.001	.0002*	-0.001	.0012
Net earnings ^ 2	0.004	.0003*	0.000	.0000*	0.000	.0001*
Spouse net earnings ^ 2	0.001	.0004*	0.000	.0000*	0.000	.0001
Difference in ages	0.016	.0016*	0.001	.0000*	0.002	.0004*
Job tenure	0.005	.0011*	0.000	.0001	0.001	.0003*
% time in FT employment	0.063	.0275*	0.001	.0014	-0.011	.0007
Education	0.056	.0137*	0.001	.0007	0.001	.0037
Health score	0.011	.0045*	-0.001	.0004*	-0.000	.0012
Renter	0.013	.0167	0.002	.0008	0.002	.0044
Mortgage	0.135	.0162*	0.003	.0008*	0.010	.0044*
Spouse retired	-0.004	.0216	-0.001	.0011	-0.003	.0057
Occupational pension	0.133	.0161*	0.010	.0008*	0.023	.0041*
N	1276		1276		1276	
R-squared	0.6462		0.7634		0.4887	
All regressions also include sets of dummies for industry, wealth (banded) and age * indicates significance at the 5% level; numbers have been rounded						

Source: Data from Retirement Survey

Table A4.3

Results of probit regression, probability of retirement

Full results are reported here for the three specifications of accrual value, including cohort dummies, excluding age of eligibility. These are intended to show the coefficients on the other socio-demographic factors. A full set of coefficients on wealth and accrual variables are shown in table 4.6

Dependent variable = 1 if individual retires in period t

	Single period		Peak value		Option value	
	Coeff	SE	Coeff	SE	Coeff	SE
Total pension wealth	0.1853	0.0316	0.1599	0.0308	0.0816	0.0331
Accrual	-1.4224	0.2422	-0.5072	0.1248	-2.8157	0.5880
Spouse pension wealth	0.0386	0.0165	0.0297	0.0166	0.0188	0.0165
Net earnings	0.0086	0.0102	0.0059	0.0103	0.0091	0.0099
Spouse net earnings	-0.0110	0.0065	-0.0095	0.0065	-0.0118	0.0065
Net earnings ^ 2	-0.0004	0.0004	-0.0002	0.0004	-0.0002	0.0004
Spouse net earnings ^ 2	0.0005	0.0005	0.0004	0.0005	0.0006	0.0005
Difference in ages	-0.0040	0.0021	-0.0032	0.0021	-0.0017	0.0022
Job tenure	0.0003	0.0013	0.0007	0.0013	0.0047	0.0013
% time in FT employment	0.0167	0.0361	0.0120	0.0364	0.0184	0.0355
Education	-0.0194	0.0194	-0.0186	0.0196	-0.0151	0.0193
Health score	0.0171	0.0088	0.0163	0.0091	0.0136	0.0089
Renter	-0.0034	0.0225	-0.0077	0.0224	-0.0046	0.0223
Mortgage	-0.0325	0.0215	-0.0357	0.0215	-0.0269	0.0216
Spouse retired	0.0871	0.0389	0.0955	0.0397	0.0866	0.0386
Occupational pension	0.0600	0.0183	0.0477	0.0190	0.0599	0.0386
All regressions also include sets of dummies for industry, wealth (banded) and cohort						

Source: Data from Retirement Survey

Chapter 5: What do defined contribution pensions mean for retirement?

In recent years, the UK, like the US, has experienced a significant shift in private pension provision away from employer-provided defined benefit (DB) schemes that typically guarantee a pension linked to years' service and final salary, towards defined contribution (DC) schemes, where the value of the pension depends on contributions and investment returns. By 2004, half of all men who had opted out of the state second pension scheme had a DC scheme and, as shown later in this chapter, the majority of men currently approaching retirement have at least some pension wealth in a DC plan.

This shift in pension provision has a number of implications for the allocation of risk to individuals and for ensuring the adequacy of saving for retirement since in most DC schemes this is the individual's responsibility (see Banks and Blundell, 2005, for further discussion of these issues). The particular issue that is addressed here is what the shift might mean for the timing of retirement. As shown in the previous chapter, pension incentives have an important role in affecting when people retire and the growth of DB occupational pension schemes accounts for at least part of the shift to early retirement that occurred in the 1980s and early 1990s. Since wealth and accrual will typically be different in DC plans, it is

natural to consider what effect this might have on the timing of retirement going forward.

This chapter addresses two questions.

The first is how retirement incentives evolve in DB and DC schemes and what this might mean for the pattern of retirement under the two types of plan. As shown in Friedberg and Webb (2005) the profile of accruals in DC schemes is far smoother than that in a DB scheme that offers particular early retirement incentives, and retirements are therefore likely to be less clustered around particular ages.

The second is how individuals actually respond to incentives in DB and DC schemes. In practice there are a number of reasons why the responses to the same level of (modelled) wealth and accrual might differ, including differences in the accuracy of modelling wealth and accrual, differences in individuals' understanding of the incentives in DB and DC plans, their different risk properties[56] and flexibility. I test this explicitly using data on a cohort of retirees from the first two waves of the English Longitudinal Study of Ageing (ELSA).

The UK is an interesting case to look at for a number of reasons.

- First, DC schemes really took off in 1988 when the government allowed people to opt out of secondary state provision into DC schemes as well as

[56] It is well-recognized that the two types of scheme allocate risks differently between individuals and employers. In DB schemes, individuals are exposed to employment risk, although much of this will have been resolved in the run up to retirement, but there is still a very real risk that the employer goes bust. In DC schemes, individuals may still be exposed to investment risk in the

DB schemes. This means that, among the cohort of people currently approaching retirement age, coverage of DC schemes is widespread, including many for whom it is their single most important form of pension wealth.

- Secondly, for most people with private pensions in the UK, their private pension is typically their primary pension in terms of value and will therefore be crucially important in determining their retirement. This is because most people with a private pension choose to opt out of the secondary (earnings-related) state pension and the basic state pension that they are entitled to has declined in value relative to earnings to a level as to be relatively unimportant for determining retirement for most people with an additional private scheme. This make the UK a good case for examining differences in the effect on retirement of DB and DC schemes since, for people with these schemes, their retirement will be driven largely by their private plans and not by separate, and possibly different, incentives in their state pension.

- Finally, there are particular institutional features of the UK pension system which make it interesting to look at, including the compulsory requirement to annuitize DC pension wealth before age 75.

This is not the first attempt to address the issue of what the shift from DB to DC schemes might mean for the timing of retirement. Friedberg and Webb (2005)

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run-up to retirement. Coile and Levine (2006) and Gardner and Orszag (2003) present mixed evidence on the impact of stock market falls on retirement.

have addressed the same issue in the US. Using a sample of workers aged 51 – 61 in the 1992 wave of the Health and Retirement Survey, they estimate a probit model of retirement as a function of DB and DC pension wealth and DB pension accruals (plus demographic and other controls). They do not include a measure of forward-looking accrual for DC pensions in their regression arguing that such measures are not meaningful for DC plans. However, the next section shows that is not necessarily the case. Coile and Gruber (2007) also separately model the effect of wealth and accrual in DC schemes and find that DC accrual has a significant effect (at the 10 per cent level).

In both of these earlier studies, DC pension wealth, unlike DB pension wealth, does not have a significant effect on the timing of retirement, although it enters positively. In this paper, DC wealth has a negative (but insignificant) sign. Taken together these results indicate that the effect of (modelled) DC pension wealth on retirement differs to that of (modelled) DB wealth. As already discussed, there are many possible reasons why this might be the case. I present some supporting evidence to show that it is consistent with the more flexible nature of DC plans.

The plan of the chapter is as follows. The next section compares the incentives in DB and DC plans and their likely effect on retirement. Sections 5.2 and 5.3 describe the ELSA data and presents the empirical results. Section 5.4 concludes.

5.1. Retirement incentives in DB and DC schemes

How do pension wealth and accrual evolve with age of retirement in the two different types of scheme?

Defined benefit schemes

In a typical DB scheme, the final pension received if the individual retires at age, a, is linked to number of years' membership of the scheme (N_a), a specified accrual rate (ϕ), and pensionable earnings at age a (PE_a).

$$P_a = N_a \phi PE_a$$

By delaying retirement, the value of pension wealth changes in the following ways:

- By carrying on working, someone can increase the value of their lump sum and final pension by increasing the final salary on which the pension is based and the number of years' service, typically up to a maximum of 40. There may be a deferral rate for delaying retirement beyond this.

- By delaying retirement, they lose the value from getting the lump sum now, and one year of the pension that they would have been entitled to if they retired now. In practice, there may be a normal or early retirement age, before which it is not possible to draw a pension or take a lump sum. Depending on the particular scheme, there may also be early retirement windows at particular ages, allowing someone to retire and receive the full pension they are entitled to, or a pension reduced at an actuarially favourable rate. As already shown, these windows are associated with strong incentives to delay retirement until the age of eligibility, and to retire at that age.

- Finally by carrying on working, there is a probability of dying without receiving any pension, although their survivor is likely to receive benefits.

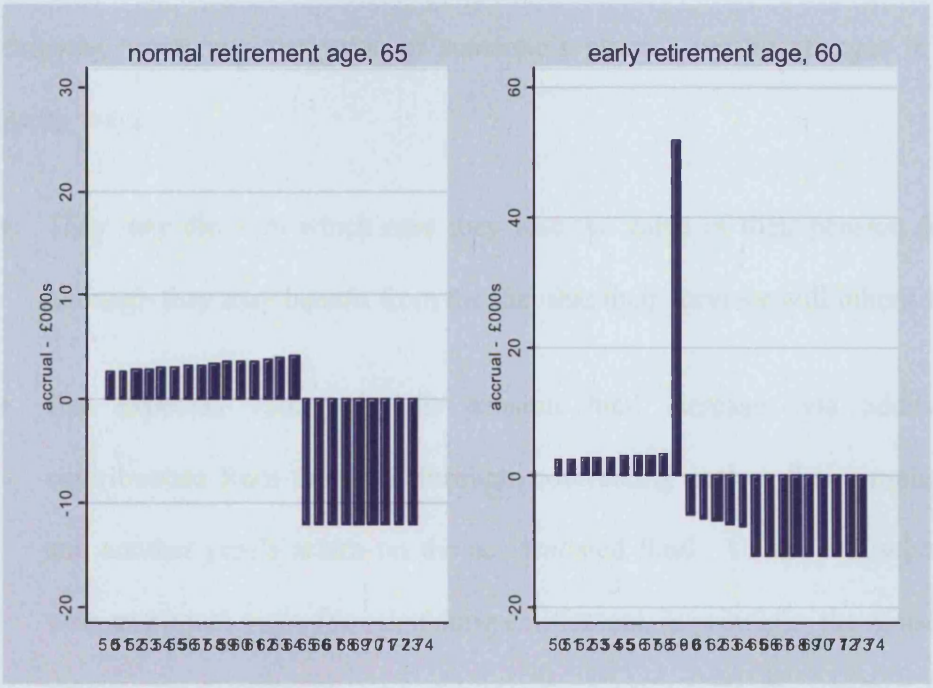
As shown in Figure 5.1, panel a, under a typical DB plan with no early retirement scheme, accruals are fairly smooth up to the normal retirement age, which in this case, coincides with the maximum possible number of years' contributions (40). After this age, no further addition to pension wealth is possible and the individual loses a year's pension income for each year of delay, resulting in a negative accrual.

But, panel b, shows the pattern of accrual for a scheme that offers the option of early retirement at age 60 with no reduction in pension.[57] In this case, there is a big incentive to delay retirement from age 59 in order to become eligible for the scheme. By comparison, the single period accrual associated with delaying retirement from age 58 to 59 (and at earlier ages) is relatively small. But, it clearly under-estimates the true incentive to stay in work until age 59, which is the retained option of retiring at 60 and becoming eligible for the early retirement scheme. As discussed in the previous chapter, the option value model (or peak value model) is well-suited to picking up these crucial non-linearities by considering, at each age, the gain from postponing retirement until all possible future ages.

[57] This may sound generous, but is not atypical of many schemes in the UK, as shown in chapter 4.

Figure 5.1

Pattern of accruals by age, DB schemes



Defined contribution schemes

What about someone with a DC scheme? Their pension is determined by the value of their pension fund at that age, which depends on past contributions and rates of return, and, in the UK, the annuity rate. In the UK, up to one-quarter of the value of a pension fund can be taken as a lump sum, but three-quarters must be annuitized before the age of 75. The annuity rate depends on the age at which someone chooses to annuitize, the size of annuity purchased and the type of annuity chosen. Numerous studies have shown that the money's worth ratio of annuities is typically less than one (see Finkelstein and Poterba, 2002 and 2004, Cannon and Tonks, 2004, and Murthi et al, 1999) so the expected present value of

pension wealth is equal to the discounted, expected sum of annuity income, not the fund value.

By delaying retirement, the value of someone's pension wealth changes in the following ways:

- They may die – in which case they lose the value of their pension fund, although they may benefit from the fact that their survivor will inherit it.

- The expected value of their pension fund increases via additional contributions from the state (through contracting out) or their employer, and another year's return on the accumulated fund. Unlike DB schemes with maximum years for calculating entitlement, in principle, the monetary value of the fund could carry on increasing up to age 74, the maximum age of annuitization.

- After age 50, the first year in which someone can draw a pension, there is a loss to delaying receipt of the lump sum and the individual loses one year of pension income but, by delaying retirement to an older age, they face a higher annuity rate.[58]

If the change in annuity rates with age were exactly actuarially fair, the loss of one year's annuitized income would exactly equal the expected value of the change in annuity rate times current fund value. In practice, however, this is typically not the case. Figure 5.2 plots the expected value of a £100,000 annuity fund for

[58] Annuity rates may also change with time, although someone could in principle hedge return risk against annuity rate risk.

someone buying a single, level annuity at different ages. Annuity rates are taken from the FSA's comparative annuity table – at each age, the best rate is used.[59] In this case (based on a 4% nominal discount rate and survival probabilities for personal pension annuitants (lives) from the Continuous Mortality Investigation Bureau, 2006) the profile shows that the expected value of the annuity is broadly constant across most of the age range, but rises at older ages. This differs to the finding of earlier studies (Finkelstein and Poterba (2002, 2004) and Murthi et al, 1999) that the expected value of annuities falls with age, which they argue reflects selection effects.[60] However, the difference reflects the fact that both the shape as well as the level of the age profile depends on assumptions regarding both discount rate and survival probabilities, suggesting that each individual may have an optimal age of annuitization, reflecting their rate of time preference and their subjective life expectancy. It is beyond the scope of this paper to model this formally,[61] but at the very least, this highlights that the annuitization requirement, combined with the pricing of annuities at different ages, has implications for the timing of retirement, athough the magnitude of these effects is relatively small.

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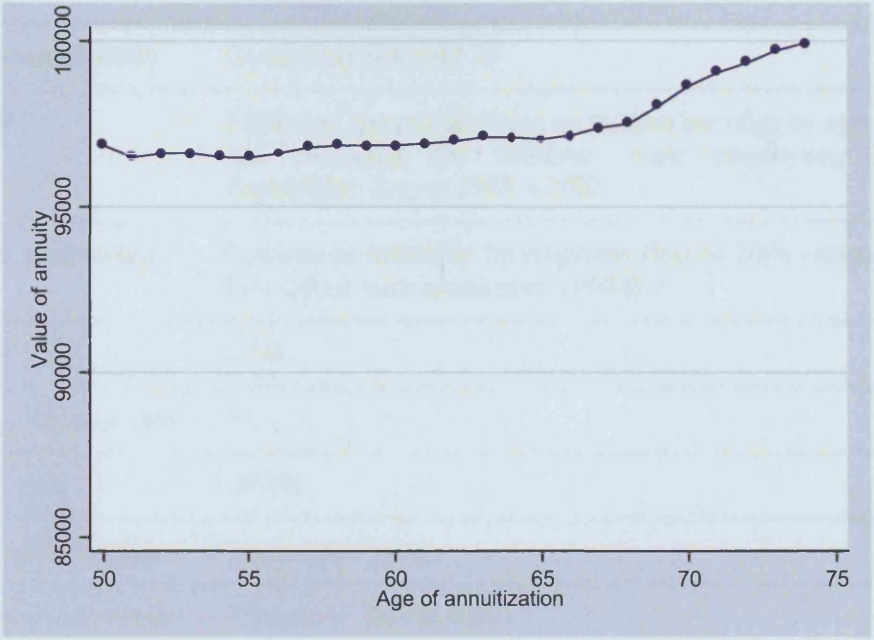
[59] Six providers quoted rates at all ages with no restriction on eligibility. The best provider changes with age, suggesting interesting selection effects with age across providers, or different assumptions about mortality.

[60] the higher annuity rate that is available at older ages of annuitization will be worth more to people who expect to live longer, who will therefore tend to annuitize later, and wealthier individuals (who tend to live longer) may have alternative sources of wealth to draw on in retirement; healthier individuals will also be able to carry on working for longer and will not need to draw their pension

[61] For a more detailed analysis see for example, Milevsky and Young (2007)

Figure 5.2

Expected annuity value, by age (£100,000 annuity)



In order to get a better understanding of how DC pensions might affect the timing of retirement compared to DB pensions, I simulate pension wealth and accrual under the two types of scheme for the same (single, male) individual. In order to highlight the effect on retirement arising from the shape of accruals, rather than differences in levels of wealth, I set the contribution rate in the DC plan equal to 13.5% in order to generate pension wealth of roughly the same order of magnitude at age 65 in the two schemes.[62] Box 1 summarizes the assumptions underlying the stylized modeling.

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[62] This rate is high compared to the actual contribution rate in most DC schemes, but individuals in DC schemes will typically additionally receive contracted out rebates. Low rates of persistency in DC schemes will also tend to reduce pension wealth in practice, see Smith (2006).

Box 1: Key assumptions

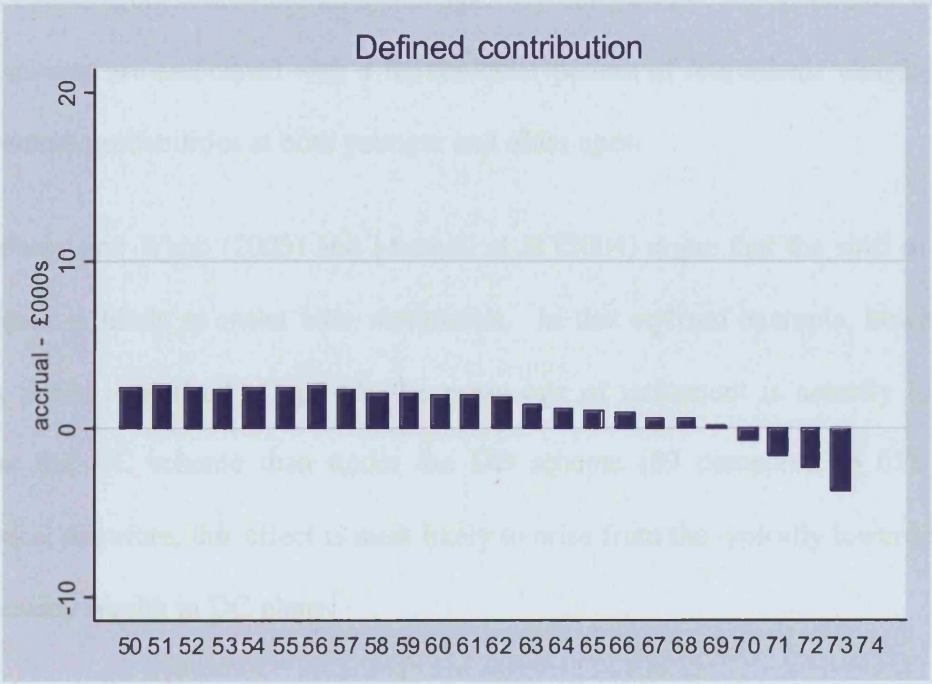
Variable	Assumption
Employment History	Continuous from age 25
Earnings	Estimated age profile based on median earnings by age, cohort and education for full-time, male employees, Family Expenditure Survey 1978 – 2002
Survival probabilities	Continuous Mortality Investigation Bureau 2006 estimates for Life Office male pensioners, (PNML)
Inflation rate	2.5%
Nominal discount rate	5%
Accrual rate	1/60 th
Pensionable earnings	Final year's salary
Nominal equity return	7% (minus 1% for costs)
DC contribution rate	13.5% earnings
Annuity rate	Best rate, level annuity, non-smoking male investing £100,000 (Financial Services Authority, May 2007)

The patterns of accrual generated for someone in a DB scheme have been shown in Figure 5.1. For comparison, figure 5.3 plots the age profile of single period accruals for someone in a DC plan. Compared to the DB scheme there are no kinks associated with particular ages and the profile of accrual rates is smooth. It does, however, turn negative before the maximum age of annuitization, suggesting the existence of a peak value. With a positive investment return, the financial value of the pension fund will continue to increase up to age 74, but the accrual will turn negative once the combined effect of discounting and mortality is greater than the growth of the fund through contributions and returns. As shown in Figure 5.3, this begins to happen from age 70 onwards. In this example, it has

been assumed that the fund continues to be invested in equity, and that the contributions continue at the same rate. In practice, a shift into safer assets ("lifestyling")[63] and/or a reduction in contributions with age[64] will both bring forward the age at which the accrual turns negative.

Figure 5.3

Pattern of accruals by age, DC scheme



The age profile of accruals shown in Figure 5.3 suggests that the associated pattern of retirements is likely to be far smoother in a DC scheme than in a DB

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[63] This is a common default option, particularly in stakeholder pensions, see Blake et al (2005).

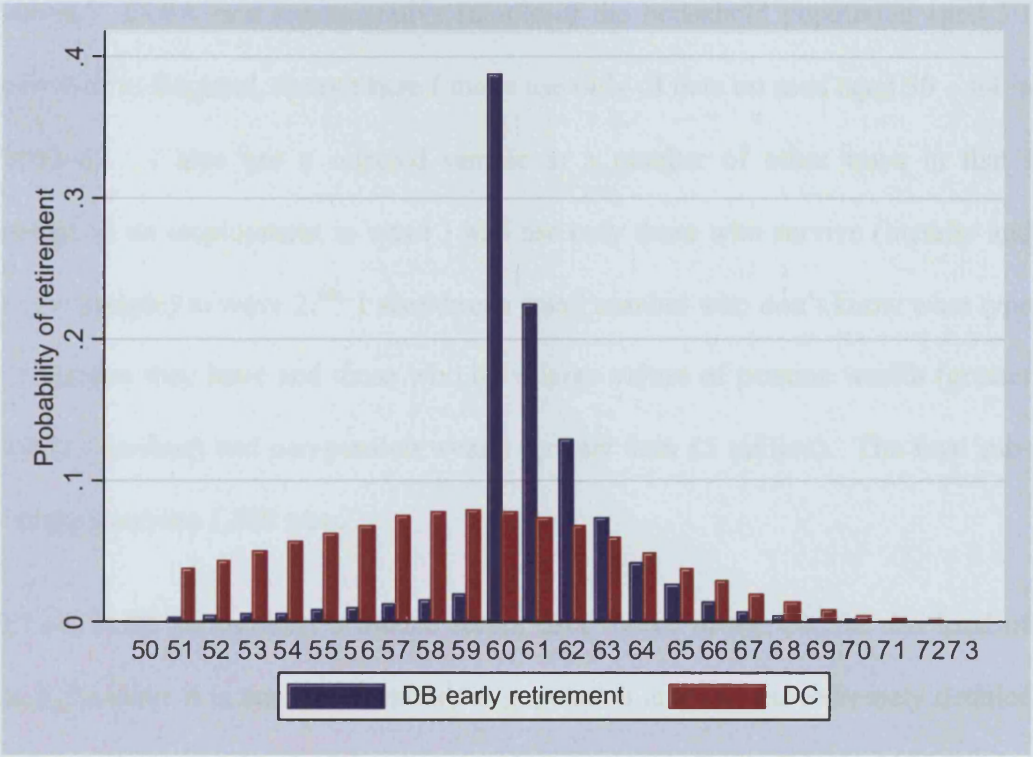
[64] In the UK, contributions made to a DC fund as a result of the individual contracting out of the state secondary pension stop at age 65.

scheme, particularly a DB scheme with an early retirement window. To illustrate this, I take the coefficients on wealth and peak value estimated in the previous chapter and in Figure 5.4 show the predicted retirement hazards at each age that would arise under the two types of scheme. This highlights how the early retirement window concentrates retirements around the age of first eligibility – encouraging people to delay retirement until they are eligible for the scheme and then encouraging retirement after this age. By comparison, the incentives in the DC scheme are associated with a far smoother pattern of retirements with higher retirement probabilities at both younger and older ages.

Friedberg and Webb (2005) and Munnell et al (2004) argue that the shift to DC schemes is likely to mean later retirements. In this stylized example, however, with wealth equalised at age 65, the mean age of retirement is actually lower under the DC scheme than under the DB scheme (59 compared to 61). In practice, therefore, this effect is most likely to arise from the typically lower levels of pension wealth in DC plans

Figure 5.4

Predicted retirement hazards by age – DB and DC schemes



However, the estimates of the effects of wealth and accrual on retirement are based on retirements that took place between 1988 and 1992, a time when DC pensions were largely irrelevant for individual retirement decisions. They therefore reflect individuals' responses to incentive in state and DB schemes. It has been assumed that (modeled) wealth and accrual have the same effect in a DC plan as in a DB plan, but there are several reasons why this might not be the case in practice, and this is explored in the next section.

5.2 DB and DC schemes in the ELSA data

To estimate the effect of DB and DC pension incentives on retirement, I use panel

data from the first two waves (2002–03 and 2004–05) of the English Longitudinal Study of Ageing (ELSA) to model the probability of retiring between the two waves.[65] ELSA is a representative sample of the household population aged 50 and over in England, though here I make use only of data on men aged 50 – 64 in 2002–03. I also use a selected sample in a number of other ways in that I condition on employment in wave 1 and use only those who survive (literally and in the sample) to wave 2.[66] I also drop a small number who don't know what type of pension they have and those who have large values of pension wealth (greater than £1 million) and non-pension wealth (greater than £5 million). The final sub-sample contains 1,478 men.

ELSA is the far the best available recent data source in the UK for this kind of analysis since it is targeted on an older population and collects extremely detailed information on individuals' pension schemes, as well as demographic, socio-economic and health variables. However, as will become clear, when trying to model the complexities of the UK pension system where individuals may have multiple pension schemes, the sizes of relevant sub-samples are a potentially

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[65] Further details on the ELSA data can be found in Marmot, *et al*, (2003).

[66] Clearly this selection may have non-trivial effects on the results. Those who have already retired by wave 1 may include both those who are very responsive to pension incentives and/or those who have strong preferences for early retirement, independent of pension incentives. Ideally the effects of the selection would be controlled for explicitly. The only defence is that I follow the example of almost all other papers before which do not.

limiting factor, although this situation should improve as more waves of the data become available.

ELSA collects information on up to two current pensions and up to three past pensions. Box 2 describes how current and future wealth is calculated for each type of pension. In practice, as shown in Table 5.1, the number of different pensions an individual may have gives rise to a high degree of complexity in categorising individuals' pension type. Almost 90 per cent of the sample has some private (DB or DC) pension. Most can be categorized in terms of a single current private pension, but one-third has two or more private pensions, often of different types. Here, I aggregate pension wealth by type – so that if someone has a current and a past DB pension, the value of both of those schemes will contribute to their DB pension wealth, although of course, only their current scheme will contribute to the accrual.

Box 2 – calculating pension wealth for the ELSA sub-sample

All calculations use age-specific life expectancies for the cohort from the Government Actuary's Department and a 5% nominal discount rate. Earnings are assumed to remain constant in nominal terms.

Basic state pension

Individuals are credited with full-time employment since they left full-time education. Survivor benefits are calculated based on the age of the spouse.

Secondary state pension

Entitlement is calculated on the basis of full-time employment and earnings since SERPS was introduced in 1978. In the absence of detailed earnings histories, past earnings are imputed on the basis of cohort and education, subject to a constant adjustment factor that reflects the ratio of their observed earnings at wave 1 to the cohort/education average for that year. No-one in a DB or employer-DC scheme is assumed to receive any state secondary pension, but everyone with an individual DC scheme is assumed to be contracted in. 50% survivor benefits are included.

DB pension

Wealth is calculated on the basis of individuals' reported years in the scheme (or, if missing, years with employer) and the self-reported scheme accrual rate. It is assumed that the pensions will be uprated in line with inflation and 50% survivor benefits are included where relevant. For current DB schemes, accruals are based on the accrual rate and constant, nominal earnings. Individuals are asked whether there is an early retirement age and, if given, are assumed to be eligible for early retirement from this age with a 4% reduction in pension value for each year of early retirement.

DC pension

Individuals are asked the value of their fund at wave 1. This is converted into a wealth value using the second best available age-specific annuity rate. For current DC pensions, the value in future years is calculated assuming that contributions remain at their current rate and the fund attracts a nominal 5% annual return.

For further details on how pension wealth has been calculated for the ELSA sample, see Banks et al (2005)

Table 5.1

Individuals' pension arrangements, ELSA sub-sample

Pension type	Proportion of sub-sample
Current DB only	0.269
Current DB, past DB	0.047
Current DB, past DC	0.008
Current DC	0.345
Current DC, past DB	0.091
Current DC, past DC	0.034
Current DB and DC	0.030
Past DB	0.063
Past DC	0.019
No private pension	0.094

A second issue is that, for many with DC pensions, the value of their pension is very small. Table 5.2 illustrates this. It shows mean, median and 25^{th} and 75^{th} percentile values of the distribution of pension wealth in DB and DC schemes. The mean level of pension wealth in a DC scheme is less than a quarter that in a DB scheme, and the median level is less than 10%. Thus, for many people with a DC scheme, other DB or state schemes may be more important in determining their retirement in practice. To overcome this problem, I define an individual's main pension type to be DC (or DB) only if the value of wealth in their DC (or DB) plan is greater than the value of their state pension wealth. Fewer than one-quarter of people with a DC plan have greater value in their DC scheme than in the state pension, compared to nearly 80 per cent of those with a DB plan. As shown in Table 5.2, defining individuals according to their main pension type reduces the gap between DB and DC schemes, but does not eliminate it. It also changes the distribution of pension type with earnings, as shown in Figure 5.5.

Looking simply at pension type suggests that more than half of those in the bottom 20% of the earnings distribution have a private (DB or DC) pension. However, taking into account value shows that the state pension is the main pension for more than 80% of this group. The importance of DB and DC pensions rises systematically with earnings. For all earnings groups, the average value of (main) DC plans is less than the average value of (main) DB plans, although this difference is most pronounced for the highest earners.[67]

Table 5.2

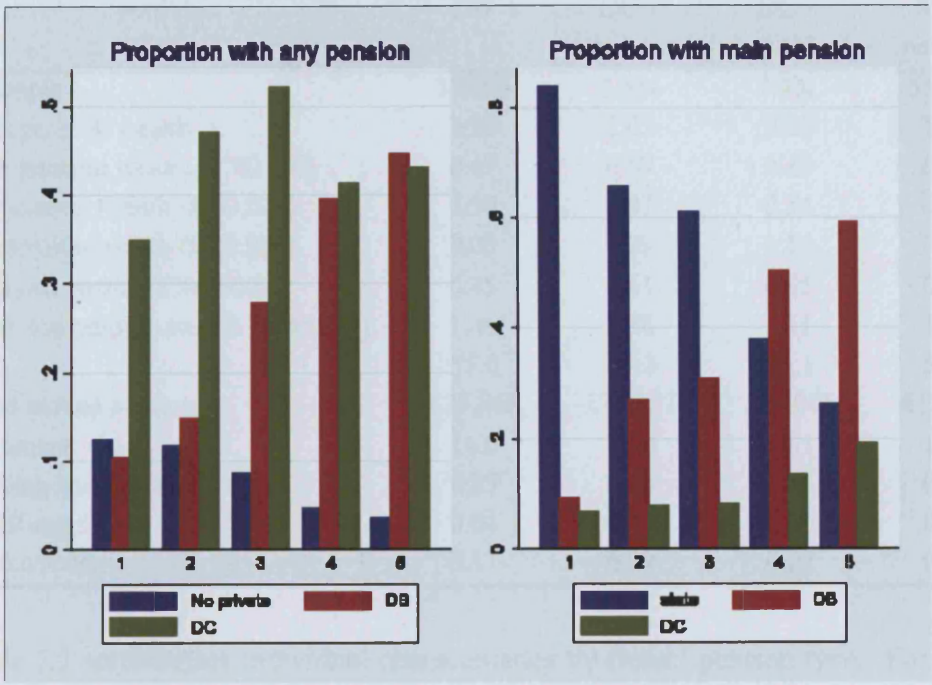
Distribution of wealth in DB and DC schemes (£'00,000)

	Mean	25%	50%	75%	N
Value of DB pension	2.19	0.74	1.88	3.06	670
Value of DC pension	0.49	0.07	0.18	0.46	746
Value of DB pension – main pension only	2.73	1.48	2.28	3.37	528
Value of DC pension – main pension only	1.63	0.61	0.98	1.42	166

[67] For the US, Samwick and Skinner (2004) and Poterba et al (2004) show that levels of wealth in DC schemes are high, even compared to DB wealth.

Figure 5.5

a. Proportion of sample with different pensions, by earning quintile



b. average pension value, by earning quintile

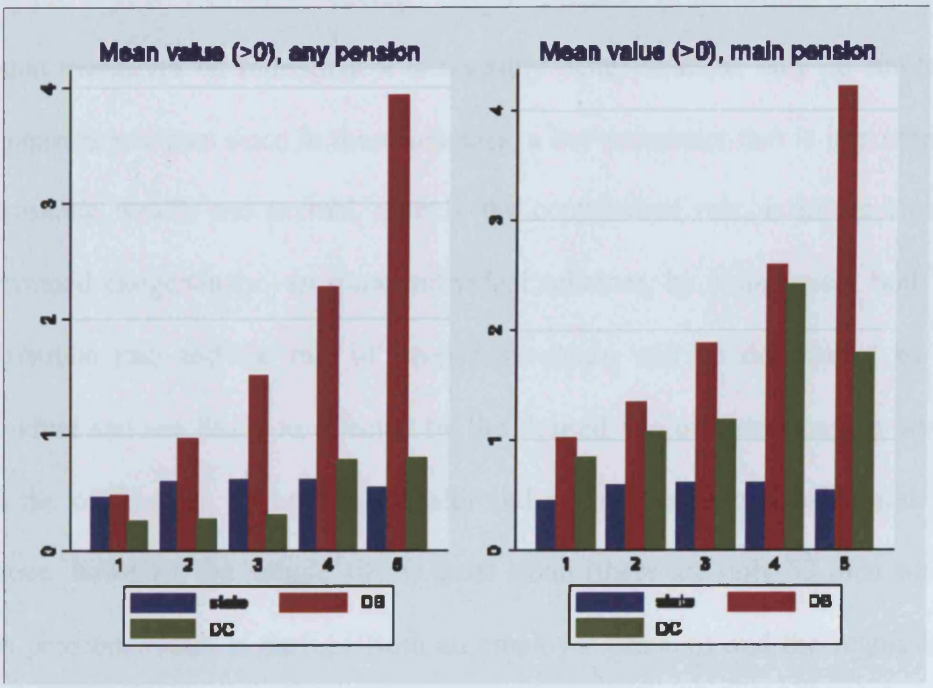


Table 5.3

Individual characteristics, by main pension type

	DB	DC - employer	DC - individual	State pension
% sample	33.8%	3.6%	7.4%	55.3%
Total pension wealth	3.26	2.05	2.22	1.38
State pension wealth (£'00,000)	0.47	0.59	0.45	0.63
DB pension wealth (£'00,000)	2.59	0.07	0.54	0.03
DC pension wealth (£'00,000)	0.03	1.29	1.16	0.10
Financial wealth (£'00,000)	0.45	0.61	0.65	0.39
Total non-pension wealth (£'00,000)	1.46	3.18	3.11	1.73
Age	55.0	55.2	55.1	56.6
Gross annual earnings	£27,965	£34,357	£41,006	£17,113
Job tenure	16.0	19.6	16.1	10.9
% doing manual work	0.25	0.26	0.35	0.46
% self-employed	0.04	0.02	0.56	0.31
% who retire	0.17	0.09	0.09	0.15

Table 5.3 summarizes individual characteristics by (main) pension type. For DC pensions, the sample is split according to whether the scheme is run by the employer or is an individual scheme. For the purposes of modelling the effect of pension incentives on retirement it is arguably better to focus only on employer DC pension schemes since in these schemes, a key parameter that is important in determining wealth and accrual, namely the contribution rate, is in most cases determined exogenously. In some individual schemes, by comparison, both the contribution rate and the rate of investment return will be determined by the individual and are likely to affected by the desired age of retirement, in which case the coefficients on both the wealth and accrual terms will be biased. In practice, however, the sample size is quite small (there are only 53 men whose main pension wealth is derived from an employer pension) and the regressions below include all men with a main DC pension as well as those who have an

employer DC scheme.

Table 5.3 shows that men with most of their pension wealth in the state pension form a fairly distinct group from the rest. They have the lowest level of pension wealth. They are typically older, less well-paid, have shorter job tenure and are more likely to be doing manual work. Those with DC pensions have higher average earnings than those with DB pensions and higher levels of non-pension wealth, although the value of their pension wealth is lower. Of course, the difference in their pension income at retirement may be smaller since most people with DC pensions choose single life, nominal annuities, whereas DB pensions automatically uprate income in line with inflation and provide for 50% survivor benefits and the wealth reflects this. A high proportion of men with individual DC plans are self-employed, and we control for this in the regression analysis.

The final row of Table 5.3 shows the proportion of each group who retire between the two waves. This is significantly higher among the group with a (main) DB scheme than among those with a (main) DC scheme and, controlling for their different ages, than among those whose main pension is from the state. A key question is the extent to which these differences are attributable to pension incentives.

5.3 Regression analysis

I estimate a model of the following form using a probit regression:

$$R_i = \beta_0 + \beta_1 SPW_i + \beta_2 DBW_i + \beta_3 DCW_i + \beta_4 SPA_i + \beta_5 DBA_i + \beta_6 DCA_i + \beta_7 NRA_i + \beta_8 ERA_i + \beta_9 AGE_i + \beta_{10} \ln Y_i + \beta_{11} (\ln Y)_i^2 + X_i \gamma' + u_i$$

Where *R* is a dummy variable equal to one if the individual retires (is not in paid employment) by wave 2.

SPW is the individual's wealth in state pension at wave 1, which is defined for everyone in the sample. *DBW* is equal to the level of DB pension wealth at wave 1 for people with a (main) DB pension and *DCW*, the level of DC pension wealth for men with a (main) DC pension. Including DB wealth and DC wealth for everyone does not change the results, but the log likelihood indicates that the fit is slightly worse. Because *DBW* and *DCW* are missing for many people, the wealth variables are included as levels rather than logs; but I drop anyone with more than £1 million in either a DC scheme or a DB scheme to avoid dominance by these extreme values. Entering each of the wealth terms in this way assumes that they have an additive effect, in other words that £100,000 in a state pension has the same effect irrespective of what other DC or DB pension wealth someone has, although £100,000 in each of the schemes is allowed to affect the retirement decision differently.

SPA, *DBA* and *DCA* are the forward-looking accrual measures for each of the three pension types. I define *SPA* to be equal to peak value (or single period accrual) in state pension wealth only for people whose main pension is the state pension. *DBA* and *DCA* are defined to be equal to peak value (or accrual), including the change in state pension value, for people whose main pension is a DB or DC plan. I also try including terms that identify only the change in DB or DC component of pension wealth for those whose main pension is a DB or DC plan, and the change in state pension wealth for everyone, but this specification

results in a worse fit.

To capture forward-looking accrual incentives, I try both peak value and single period accruals. As discussed in the previous chapter, the option value may provide a more accurate reflection of the underlying incentives, but only if it is correctly specified, while peak value may provide a more robust approximation. From a practical point of view and of particular relevance here, the peak value is probably better-suited to testing whether different types of pension (state, DB and DC) have different effects since it allows wealth and accrual for different types of scheme to enter separately.

As has already been shown, the strength of option value and peak value are that they can capture crucial non-linearities in accruals. This is arguably less important in the case of DC pensions where accruals are smooth. In this case, the peak value will simply add up across a set of relatively constant accruals and reflect years to peak. For DB pensions, there is currently insufficient detailed information in ELSA to allow full modelling of the non-linearities of early retirement windows. In practice, therefore, the peak value may not perform better than single period accruals, although for DB pensions, this is a limitation of the data. The results in Table 5.4 appear to confirm this – on the basis of the log likelihood the single period accruals appear to perform slightly better than the peak value.

The peak value is defined as the difference between the maximum expected future value of pension wealth and the expected value in 2004 (ie at wave 2). For single period accruals, I include the change in expected wealth between 2004 and 2005

(acc2005) which should have a negative effect on the probability of retiring by wave 2). I also tried including the change in expected wealth between 2003 and 2004 (acc2004) which should encourage people to stay in work past wave 1, but may be positively correlated with retirement by wave 2, but this did not improve the results, however. In all cases, negative values are set to zero as is common practice (eg Friedberg and Webb, 2005, and Coile and Gruber, 2007). Including the negative values does not substantively change the results.

The *NRA* is a dummy equal to one if the person reaches the "normal retirement age" for their job between the two waves (equal to 65 if the normal retirement age is missing), while *ERA* is a dummy equal to one if they reach their reported "early retirement age" (also equal to 65 if missing). Since kinks in accrual in DB schemes are often strongly associated with early and normal retirement ages, this is likely to reduce the coefficient on the accrual term, but will ensure that it picks up the financial incentive, rather than any social norm effects. Both terms are positive, and usually significant, in the different specifications.

I include a linear age term (AGE), imposing the assumption that preferences for eg leisure evolve in a constant way with age. Including a full set of age dummies has little effect on the results. I also include both the log of earnings ($ln\ Y$) and its square. Controlling separately for earnings is clearly important since earnings are highly correlated with both pension wealth and accrual and may separately affect retirement. The earnings terms are jointly, and usually individually, significant across specifications.

X is a vector of other control variables including the log of non-pension wealth,

whether the individual is working full-time at wave 1, whether the individual is self-employed at wave 1, whether they are in manual work at wave 1, their job tenure at wave 1 (and its square), whether their spouse is in work at wave 1, whether they have college education and indicators for a range of health problems present at wave 1.

I also include a set of dummy variables for an individual's main pension type to pick up underlying differences in individuals across the different types of scheme that have not already been explicitly controlled for. These are insignificant in all regressions, once wealth and accrual have been added.

Table 5.4 reports the average marginal effects for the wealth and accrual terms. A full set of results for the other control variables are reported in Table A5 in the annex to this chapter. Results are given for one specification – they are qualitatively similar across all other specifications.

The first specification in Table 5.4 includes total pension wealth and peak value/ accrual, as in the previous chapter. The most directly comparable set of results from chapter 4 are in Table 4.6, panel b which include a controls for linear age and age of pension eligibility. The magnitudes of the estimated effects are broadly similar. The results from the Retirement Survey implied an increase in the probability of retirement of 3.9 percentage points for a one standard deviation increase in pension wealth, while the results from ELSA imply a corresponding increase of 4.9 percentage points. For a one standard deviation in single period accrual the results imply a reduction in the probability of retirement of 1.2 percentage points (Retirement Survey) and 1.3 percentage points (ELSA). For

peak value, the figures are 1.0 and 1.8.

Table 5.4

Regression results, probit regression, average marginal effects

Dependent variable = 1 if left work by wave 2

	Coeff	SE	Coeff	*SE*	Coeff	*SE*
Total wealth	0.0333	*.0073***				
SP wealth			0.0532	*.0481*		
DB wealth			0.0386	*.0097***		
DC wealth			-0.0220	*.0437*		
DC wealth – emp						
DC wealth – indiv						
Peak value	-0.0840	*.0659*				
SP peak			0.0561	*.1066*		
DB peak			-0.1073	*.1307*		
DC peak			-0.2414	*.2162*		
DC peak – emp						
DC peak – indiv						
Log likelihood	-475.26		-471.92			
Total wealth	0.0349	*.0072***				
SP wealth			0.0479	*.0480*	0.0483	*.0481*
DB wealth			0.0408	*.0095***	0.0399	*.0095***
DC wealth			-0.0024	*.0480*		
DC wealth – emp					-0.0312	*.1021*
DC wealth – indiv					0.0215	*.0413*
Accrual	-0.0255	*.0319*				
SP acc2005			0.0923	*.0514**	0.0760	*.0515*
DB acc2005			-0.1191	*.0673**	-0.1055	*.0673*
DC acc2005			-0.2709	*.1372***		
DC acc2005 – emp					0.1594	*.2149*
DC acc2005 – indiv					-0.3716	*.2067**
Log likelihood	-475.92		-469.66		-469.21	

Notes to table

All regressions include a full set of controls – marginal effects are reported in the annex to this chapter

All wealth and peak value terms are in £'00,000s; single period accruals are in £'0,000s

* indicates significant at 10% level, ** indicates significant at 5% level

The main interest here, however, is in the effects of the different components of pension wealth and accrual – DB, DC and state pensions.

State pension wealth is positive, but insignificant in the pooled regressions, but significant in a separate regression for people with no private pension (not reported here). This is perhaps not surprising – a greater level of state pension wealth is likely to be less important in determining retirement for those with a DB or DC scheme as their main pension. The state pension accrual term has the wrong sign. However, accrual is arguably not well defined for the ELSA sample since it varies only by whether someone is contracted in or out of the state secondary pension scheme and by date of birth.

The results show that DB pension wealth has a positive, significant effect on retirement. The peak and single period DB accrual values have the expected negative sign and the accrual term is significant at the 10% level. Again, these results suggest that single period accrual performs as well as peak value, although this is likely to be because of the limitations of the data and the lack of information on early retirement windows.

The coefficient on DC pension wealth has the 'wrong' sign, but is insignificant. This result is confirmed when the same regressions are run only for a sample of people with a DC scheme and for a sample excluding the self-employed. Previous studies that have separately included DC pension wealth (Friedberg and Webb, 2005, Coile and Gruber, 2007) have also failed to find a significant positive effect for DC pensions, unlike for DB pensions. Taken together, these results seem to suggest that (modelled) DC pension wealth does not have the same positive effect

on retirement as (modelled) DB and state pensions and there are several reasons why this may be the case.

One is that researchers are better at modelling DB pension wealth, given its formulaic nature, than they are at modelling DC pension wealth. However, in the case of ELSA this seems unlikely since individuals are directly asked to give the value of their DC pension fund.

Another issue is that individuals' perceptions of DB and DC pension wealth may be different. People may care more about future pension income than wealth per se and this may be clearer – and therefore have more of an impact – in DB and state pensions than in DC schemes. DC pension wealth also has very different risk properties to a similar level of wealth in a DB fund. By the time of retirement, much of the employment and wage risk associated with a DB scheme has been resolved.[68] In a DC scheme, however, individuals remain exposed to investment and annuity rate risk right up to retirement. While the stock market rose in value almost continuously from January 2003, the earlier falls may have had repercussions for the effect of DC pension wealth in 2002 on subsequent retirement. And as well as the effect of changes in stock market prices on the timing of retirement through their effect on wealth (see Coile and Levine, 2006, and Gardner and Orszag, 2003), individuals may also choose to delay or bring forward their retirement in line with expectations about equity prices (or annuity

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[68] although, until the recent introduction of the Pension Protection Fund, there was still a risk of the employer going out of business.

rates). With only two waves available, however, it is not yet possible to explore this using ELSA data.

A crucial difference between the two types of scheme is the extent to which contributions – and hence wealth and accrual – are voluntary. By construction, estimated DB wealth will here exclude all voluntary contributions since it is derived from individuals' scheme tenure and the accrual rate (and hence excludes additional voluntary contributions). For the majority of individual DC schemes, by contrast, contributions are almost entirely voluntary, while, even in employer schemes, some individuals may choose to contribute above the employer's minimum or required level. A particular problem with DC schemes is that the level of contributions may be endogenous to the retirement decision. If people with a strong preference for early retirement are motivated to build up large amounts of wealth then the bias would tend to overstate the effect of wealth on retirement. Another possibility, however, is that people with strong tastes for retirement saving may tend to retire later.

The final column estimates the effect of DC pension wealth and single period accrual separately for people with employer and individual schemes. The idea is that there is greater exogeneity of wealth (and accrual) in employer schemes and, therefore, that any bias problems should be less. However, the results show that in neither case is DC pension wealth significant and, perhaps surprisingly, it is employer DC pension wealth that attracts the wrong sign.

DC accrual has the right (negative) sign and enters significantly. In this case, variation in accrual is driven solely by contribution rates, which are dependent on

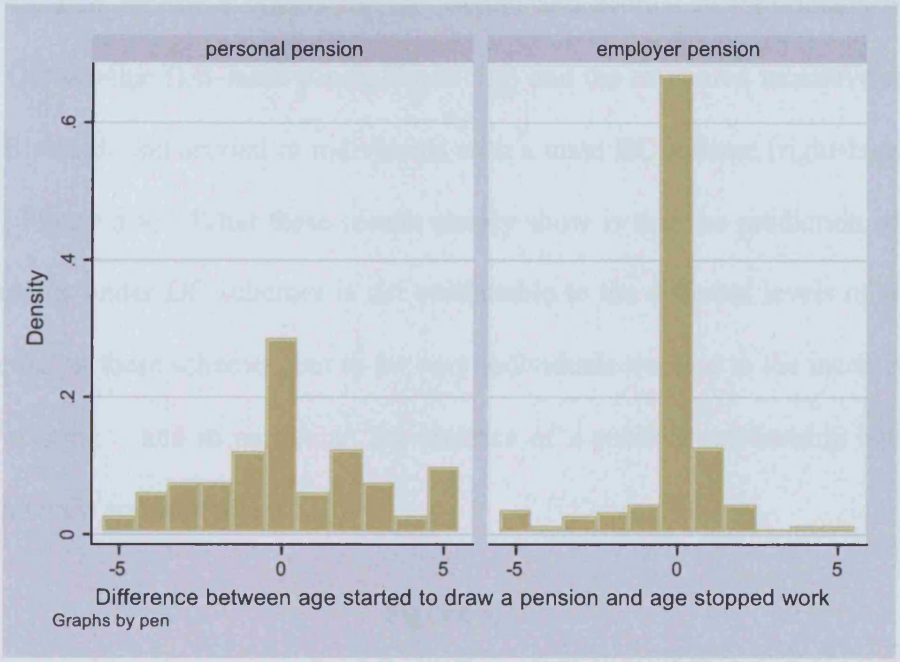
continued employment and in principle, this could account for why positive accrual would reduce the probability of retirement. However, when DC accrual is included separately for people with employer and individual schemes, it is only accrual in individual schemes that has a negative and significant effect and this result may be affected by the voluntary nature of contributions.

Finally, there are important differences in the flexibility of the two types of scheme which may have implications for the modeling of retirement. Implicit in the model of retirement adopted here is that retirement as a discrete decision (to work or not work), a permanent state, and synonymous with drawing a pension. This seems appropriate for individuals in DB plans where there is little incentive to reduce hours (since pension depends on final salary) and individuals cannot continue to build up their pension once they have left their employer. Also, until recent (2006) legislation, individuals were prohibited from working for an employer they drew a pension from. But, DC plans offer greater flexibility in terms of working and drawing a pension at the same time. And, unlike a DB scheme, only part of the accrual (the contribution to the fund) depends on continued employment. Figure 5.6 presents evidence from the British Household Panel Survey suggesting a greater dis-association between stopping work and drawing a pension for people with DB pensions than for people with DC pensions. The graphs show the difference in years between stopping work and drawing a pension. A value of zero indicates that the two are synonymous, a positive value indicates that someone started to draw a pension before they stopped work. It is plausible that the greater flexibility of DC schemes implies a less close link between work and pension, and this might explain why the effect of DC pension

wealth is different to that of DB pension wealth.

Figure 5.6

Retirement and pension receipt



To see what these results imply for the timing of retirement, Figure 5.7 plots predicted retirement hazards for people with a main DB and main DC pension. In both cases, the dummies for reaching normal retirement age and reaching early retirement age have been set equal to zero to highlight the effects of financial incentives. The figure shows that people with a main DB scheme have higher retirement hazards at all ages, but particularly at younger ages. This is consistent with the raw difference in retirement probabilities in Table 5.3.

Of course, the difference in retirement probabilities shown in Figure 5.7 might be explained by differences in the level of wealth or size of accrual between DB and

DC schemes (and other differences between individuals in the two types of scheme), as well as differences in the incentive effects of different types of pension. In order to highlight the differential incentive effects, I therefore apply the estimated incentive effects for DC wealth and accrual to individuals with a main DB scheme (left-hand panel, Figure 5.8) and the estimated incentive effects for DB wealth and accrual to individuals with a main DC scheme (right-hand side panel, Figure 5.8). What these results clearly show is that the prediction of later retirements under DC schemes is not attributable to the different levels of wealth or accrual in these schemes, but to the way individuals respond to the incentives in these scheme – and in particular, the absence of a positive relationship between wealth levels and retirement.

Figure 5.7

Predicted retirement hazards – DB and DC schemes

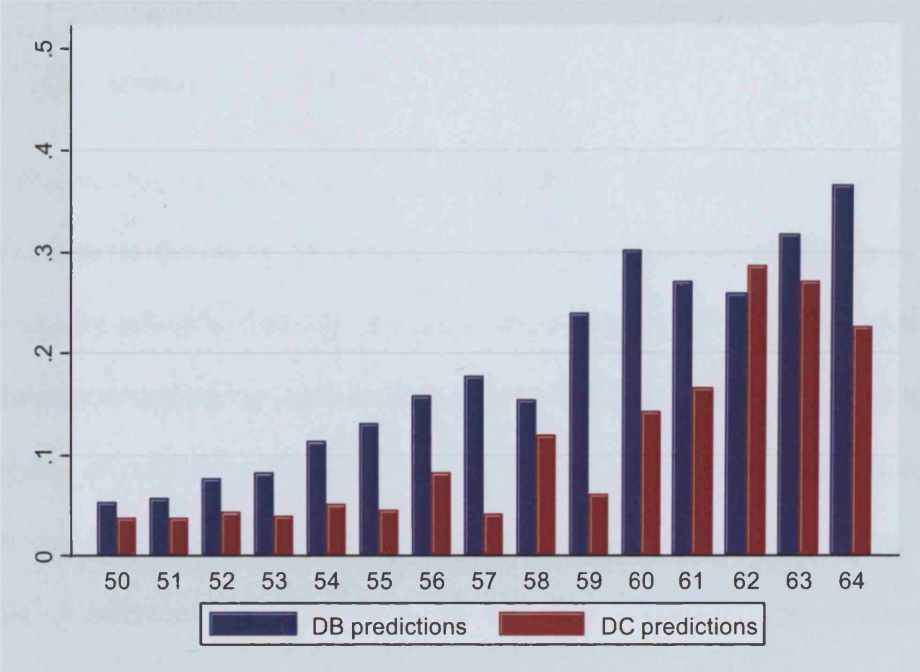
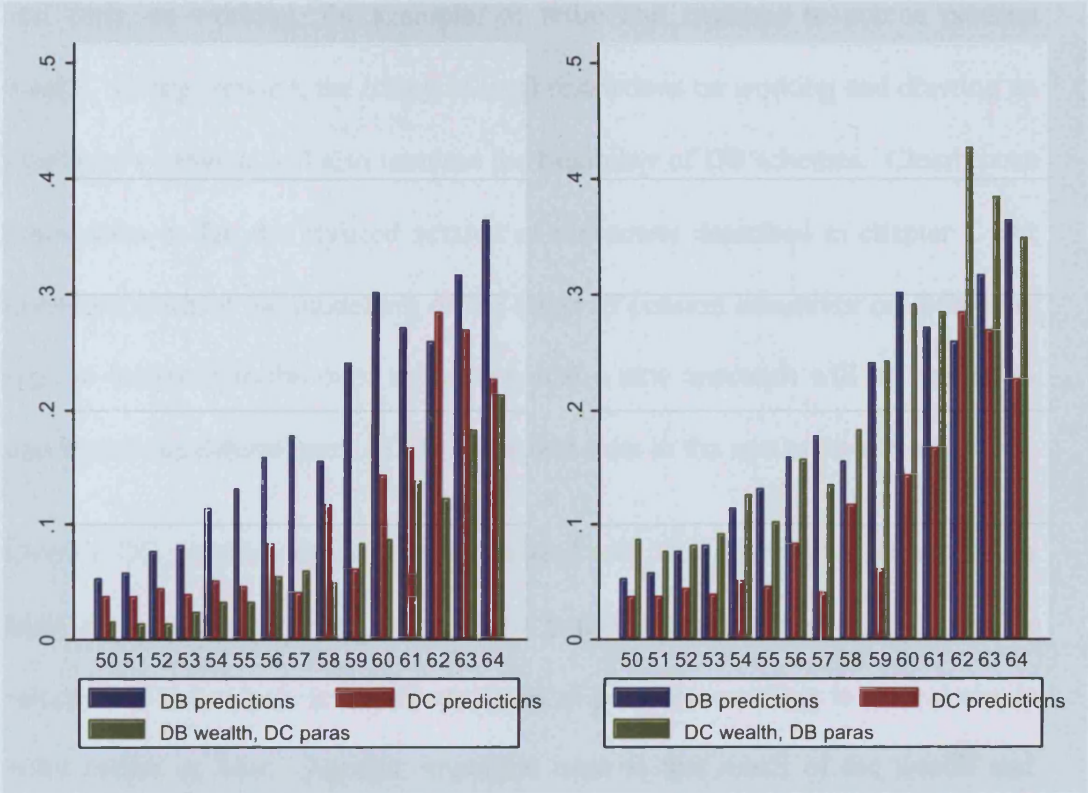


Figure 5.8

Predicted retirement hazards – DB and DC schemes



5.4 Conclusions

This chapter has shown that the shift from DB to DC schemes has important implications for the timing of retirement. DB pension schemes offered employers a potentially powerful tool for managing labour market exits. Early retirement windows provided strong age-related incentives for retirement and resulted in the clustering of retirement around a narrow range of ages. By contrast, there are fewer age related incentives in typically DC schemes, suggesting that the age profile of retirements is likely to be far smoother. Moreover, the preliminary results from the analysis of the ELSA dataset suggest a weaker link between pension wealth and retirement for DC schemes.

There are a number of possible reasons why the link may be weaker, including the more flexible nature of the schemes – the fact that someone can draw a pension and carry on working, for example, or retire and continue to accrue pension wealth. Going forward, the lifting of legal restrictions on working and drawing an employer's pension will also increase the flexibility of DB schemes. Clearly, one implication is that the stylized version of retirement described in chapter 1 that underlies much of the modelling of the effect of pension incentives on retirement will no longer describe most retirement, and a new approach will be needed to understand the determinants of labour market exits in the new environment.

Overall, DC pensions appear to be associated with later retirements, although this analysis is preliminary and not without potential issues. One is the possible selection of individuals into different types of pension according to their desire to retire earlier or later. Another important issue is that much of the wealth and accrual in DC schemes is driven by individual contributions, which are determined voluntarily. This makes DC wealth and accrual potentially endogenous, particularly for people with individual schemes while small sample sizes in the current ELSA sample preclude detailed analysis of those with an employer scheme. There is clearly further work to be done.

Annex 5: Further regression results

Table A5

Regression results, probit regression, average marginal effects

Dependent variable = 1 if left work by wave 2

	Coeff	*SE*
Total wealth	.0333	*.0074***
Peak value	-.0840	*.0656*
Age	.0123	*.0029***
Reach normal retirement age	.0946	*.0437***
Reach early retirement age	.0487	*.0265**
Ln earnings	.0292	*.0194*
(Ln earnings)^2	-.0038	*.0017***
Ln non pension wealth	.0026	*.0074*
Dummy for negative non pension wealth	.0390	*.0496*
Full time work, wave 1	-.0688	*.0333***
Self-employed, wave 1	-.0268	*.0233*
Manual work, wave 1	.0203	*.0193*
Job tenure	-.0034	*.0024*
Job tenure ^{2}	.0000	*.0000*
Partner in work, wave 1	-.0464	*.0191***
College education	-.0221	*.0207*
Mild health problems	.0554	*.0191***
Severe health problems	-.0001	*.0448*
Psychiatric health problems	.1483	*.0494***
Musculo-skeletal health problems	.0162	*.0227*
Respiratory health problems	.0232	*.0289*

Notes to table

* indicates significant at 10% level, ** indicates significant at 5% level

Chapter 6: Did abolishing the earnings rule affect employment?

The previous two chapters have considered the effect of wealth and accrual incentives in pensions on the timing of retirement. This chapter explores the impact of a pensions earnings test,[69] a particularly extreme version of a tax on older workers, operating in a number of OECD countries, which restricts the amount of state pension that can be received by people who continue to work past pensionable age, by withdrawing the pension in line with earnings at high marginal rates. Potentially, therefore, an earnings test can act as a big disincentive to employment among older workers. This chapter looks at what happened to the earnings and hours of men aged 65-69 and women aged 60-64 when the earnings test was abolished in the UK in 1989.

Table 6.1 describes the earnings tests that apply in a number of OECD countries. As can be seen, there is a wide variety of practice, from environments where it is basically impossible simultaneously to work and to receive a public pension (such as Ireland, Portugal and Spain) through to regimes where earnings can be received

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[69] Indeed, as Johnson (2000) restated, the existence of some form of earnings test and 'actuarially unfair' deferral are required if the public pension programme is to act as an implicit tax on continued work late in life.

without extra penalty.[70] Note also that many countries which operate such tests also disregard a certain level of earnings in applying the test, and that some countries also permit individuals to defer their pension, with a higher rate of pension being paid when the individual finally stops working, both of which reduce the test's effective penalty on working beyond pension age.

Table 6.1

Earnings Tests in OECD countries

	Disregard (% of average earnings)	*Withdrawal rate (%)*
Pension deferral not possible		
Canada	160	15
Greece	116	Full
Denmark	50	60
Austria	30	Full
Belgium	33	100
Norway	18	50
Australia	8	50
Ireland	None	Full
Portugal	None	Full
Spain	None	Full
Pension deferral possible		
Italy	23	100
Japan	17-90/90	20/full
United States	38	33-50
No restrictions		
Finland, France, Germany, Netherlands, New Zealand, Sweden, Switzerland, United Kingdom		

Notes: Pension receipt in Ireland, Portugal and Spain conditional on withdrawal from work; France conditional on withdrawal from normal work. Pension withdrawn at a 100 per cent rate between 29 and 33 per cent of average earnings in Belgium. Italy gives a higher disregard for self-employment incomes (which are an important income source). Australia has a means-tested social security system.

Source updated from Blöndal and Scarpetta (1999).

[70] Although, of course, such countries will still typically levy income tax and, in some cases, payroll taxes on post-retirement earnings

In 2000, the earnings test was abolished in the United States, with the aim of increasing hours of work of older people. The debate preceding the reform generated a certain amount of empirical work designed to simulate the impact of the policy. The United Kingdom, however, offers a 'natural experiment' by which the effect of such a change can be examined, since it abolished its own earnings test, known as the 'earnings rule' in 1989 (Whitehouse, 1990). The purpose of this chapter is to estimate the impact of the abolition of the earnings rule in the United Kingdom on the hours of work of older workers, comparing the findings with simulations of similar changes both in the UK and elsewhere and with one actual study of an abolition, for Canada.

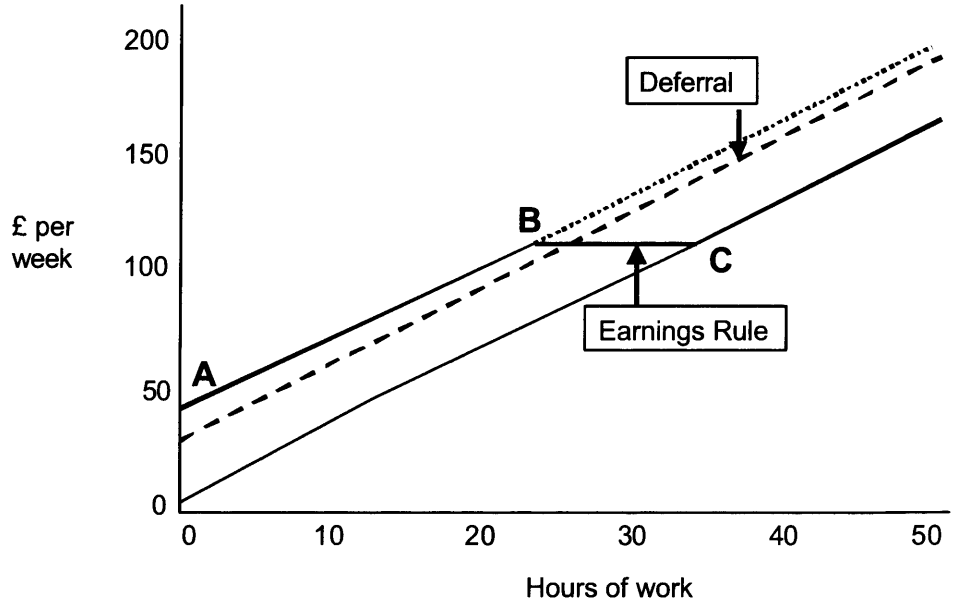
The structure of the remainder of the chapter is as follows. Section 6.2 summarises the operation of the earnings rule in the UK up to 1989 and describes other studies of earnings tests both in the UK and elsewhere. Section 6.3 writes down a simple formal model of the joint decisions concerning retirement and deferral facing an individual. Section 6.4 provides empirical evidence on the impact of abolition and provides a brief conclusion.

6.1 Background

The imposition of an earnings test generates a highly non-linear static budget constraint facing workers on reaching pensionable age. Fig. 6.1 illustrates a budget constraint that exhibits the main features of the 'earnings rule' as it operated in the United Kingdom until 1989. It assumes a wage rate of £3.50 an hour, a basic state pension of £44 per week (the level in 1989), a tax rate, net of

the age allowance (assumed equal to the basic pension), of 25% and an earnings rule operating in the following manner: gross earnings of £75 per week are exempt, the basic pension is withdrawn at 50 pence per £ of earnings from £75 up to £79, and £ for £ thereafter.[71]

Fig. 6.1
Operation of the Earnings Rule



As Figure 6.1 demonstrates, the static budget constraint exhibits a convex kink at the exempt amount (the earnings disregard) at point B and a non-convex kink where the state pension entitlement is exhausted, at point C. Friedberg (1998) provides illustrations of the very similar US earnings test.

[71] The earnings rule also contained a notional limit on exempt weekly hours but in practice, the earnings limit seems to have been the binding constraint.

In the simplest interpretation, abolition of the earnings rule linearises the budget constraint, as indicated by the dotted line in figure 6.1. Basic labour supply theory would then suggest no change in hours for non-participants at point A or for participants between points A and B, a potentially large increase in hours supplied by individuals bunched at the kink point B, and a possible negative impact on hours of those had previously worked at some point above C.[72] On balance, however, the net effect of these changes, although depending on the overall distribution of hours, might be positive, especially where hours are organised in discrete 'packages' of part-time and full-time work (Hurd, 1996). Specifically, abolition of the earnings rule might encourage individuals who had gone part-time at state pension age in order to avoid the impact of the rule to choose instead to remain in full time work for a longer period.

There are, however, complications arising from the earnings rule. First, individuals in the United Kingdom had, and still have, the opportunity to defer pension receipt. The earnings rule operated for five years after state pension age (65 for men, 60 for women) until state 'retirement age' (70 for men, 65 for women). Anyone could choose to defer receipt of the state pension for up to five years and thereby accrue additional pension entitlements at a rate of 7.5% (in

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[72] This conclusion has to be slightly qualified if there are substantial fixed costs of work and/or if current labour supply decisions take account of future retirement behaviour. In such cases, hours and participation should be simultaneously modelled by suitable techniques. We do not handle this explicitly in this particular paper, although we account for the censoring of hours and earnings at zero.

1989) for each year that they deferred.[73] This rate is approximately actuarially unfair for a single man and actuarially favourable for a single woman, given life expectancies of respectively 14.3 years at 65 for a man and 22.1 years at 60 for a women, although one should also take account of time discounting, the inheritance of deceased spouse's benefits, and the likelihood of self-selection of deferrers on the basis of individual differences in expected longevity. Note that deferral requires an explicit decision in the UK, whereas in the US, benefits in each year after normal retirement age are *automatically* increased by 6.67% for each year of full benefits lost due to the earnings test through the Delayed Retirement Credit (Gruber and Orszag, 2003). In figure 6.1, actuarially unfair deferral is illustrated by the bold dashed line. For such people who chose to defer, abolition of the earnings rule should act as a pure positive income effect, which should, on balance, reduce their hours of work.

The other complication concerns couples versus single people. Reforms of this kind may also affect spouses' behaviour, especially where one partner is over state pensionable age and the other is below. For example, abolition of the earnings rule might induce the older partner to continue in full time work rather than switch to part time work, which might in turn affect the hours or participation decision of the younger partner.[74]

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[73] The deferral rate had been raised to 7.5% in the years leading up to 1989 and was subsequently raised to 10% in 1995.

[74] Similar issues have been noted in the analysis of in-work benefits to low income married couples: see, again, Blundell *et al* (2000) for the UK, and Eissa and Hoynes (2004) for the US.

Previous research on earnings tests

In contrast with other areas of labour supply, the literature on earnings tests and older workers is limited. Moreover, much of the literature does not adequately take adequate account of the deferral option or of the problem of handling the behaviour of spouses. The traditional approach in the United States, exemplified by Burtless and Moffitt (1985), utilises a piecewise linear budget constraint approach to estimate labour supply effects of the earnings test in the US for an individual worker. Typically, such studies conclude that the test has had little effect on labour supply (for a survey, see Leonesio, 1990).

A criticism of such studies, noted by Friedberg (2000) is that, in the absence of temporal variations in the tax structure (i.e. changes in the disregards, tax rates or even outright abolition of the earnings test), estimates depend on cross sectional variation in components of income such as the wage rate and unearned income. If these correlate with unobservables, then the estimated effects will be biased. Gustman and Steinmeier's study (1986) may be subject to the same criticism concerning unobservables, but an added reason for their finding of a relatively small effect lies in their attempt to model the impact of the Delayed Retirement Credit in a structural retirement model which, as we suggested previously, should alleviate the impact of the test. The idea that an earnings test might affect the *timing* of the first claim on social security benefit is explored by Gruber and Orszag (2003) who argue that abolition of the test might accelerate the first claim on social security, so reducing labour supply in total irrespective of the behaviour of those round the kink (i.e. point B in figure 6.1).

A further criticism of quasi-structural estimation of the model (at least of its static component) arises from the use of the piecewise linear budget constraint method itself. MaCurdy, Green and Paarsch (1990) argue that the log likelihood is only defined for individuals locating at a kink like point B in Fig. 1 if the compensated substitution effect is positive. Thus there is an inherent bias in the method towards finding positive compensated substitution effects. Blundell *et al* (1998) circumvent this issue in another context by dropping observations at the kink and estimating labour supply elasticities over the rest of the sample, selectivity corrected. As Friedberg (2000) points out, however, their procedure is unappealing in the context of the earnings test since much of the 'action' is expected to derive precisely from the behaviour of those at the kink. Her own estimates by the piecewise linear budget constraint method, she argues, do not require the imposition of a positive compensated substitution effect and avoid the issue of correlation with unobservables by exploiting temporal variations in both the level of the disregard (exempt amount) to the earnings test and changes in the effective tax rate, between 1978 and 1990. She utilises the resulting elasticities to estimate that abolition of the earnings test in the US would raise hours worked of those at or above the kink at point B by 5.3%. Put simply, this would raise the hours of a part timer working 20 hours a week by one hour.

However Friedberg's work is also not immune from criticism. The first is that the 'dynamic' aspect of the issue – the accrual of Delayed Retirement Credit (DRC) from any tax levied as a result of the earnings test – is simply ignored on the grounds that people do not understand the DRC. Effectively, it is assumed that individuals are sophisticated enough to adjust their labour supply to small

variations in exempt amounts and effective tax rates while systematically disregarding the fact that tax levied will be recovered later through higher pension benefits. Second, there is always danger in extending marginal elasticities derived from small changes to construct hypothetical outcomes for large changes, such as the abolition of a whole tax regime.

The only previous study of the earnings rule in the UK is contained in a study by Zabalza *et al* (1980). They utilised data for a cross-section of people aged between 50 and 73 in 1977 to develop a discrete tri-choice model in which individuals could choose between full-time and part-time work, and non-participation. By imposing a CES utility function and requiring convexity of the opportunity set in the ordering full-time, part-time, non-participation, they were able to predict chosen states (78% of the time) and to use parameter estimates to simulate policy changes. Specifically, abolition of the earnings rule would leave participation unaffected, but raised the average hours worked (averaged over all people) by about 2% for men and 1.6% for women. Since roughly 20% of people in the relevant age range worked in the late 1970s, this gives somewhat larger magnitudes than Friedberg's estimates.

Zabalza *et al* may however overstate the success of their model. Since the age range is fairly broad, predictive power is achieved largely by predicting that people under pension age work and that the majority of older people over pension age do not work. Only 10% of actual part-time workers (amongst whom are those at the kink at point B in figure 6.1) are successfully predicted by their model. Consequently, the simulated shift from part-time to full-time work arising from

the abolition of the earnings rule must have a very high standard error.

What characterises all these studies is that they rely on simulated responses derived from labour supply modelling, although Friedberg (2000), like Blundell *et al* (1998), exploits policy variation to identify elements of model structure. A different empirical strategy is to look at actual reforms – in this case, actual abolition of earnings tests – to estimate policy effects. A standard approach in this case uses 'differences in differences', which requires finding a 'control group' who are unaffected by the reform in question and who are affected identically by other 'shocks' (for example, to labour demand). This is the approach used here. It is surveyed by Angrist and Krueger (1999) and has been used extensively to analyse the effects of comparable policy experiments concerning tax regimes.[75]

Only one study, to our knowledge, applies the method to an earnings test. Baker and Benjamin (1999) examine the sequential elimination of earnings tests from pension plans in Canada in the mid-1970s. They exploit the fact that the Quebec Pension Plan and the (rest of) Canada Pension Plan abolished their earnings tests at different times. Moreover, there was no equivalent to the Delayed Retirement Credit in the US to complicate the picture: taxed away benefits were simply lost.[76] This gives a potentially clean test of the impact. Baker and Benjamin find no evidence that abolition of the tests affected participation, some evidence that take-

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[75] For tax credits, see for example, Eissa and Leibman (1996), Eissa and Hoynes (1998), Blundell et al (2005).

[76] There were however some transition provisions which were equivalent to actuarial fair deferral, not discussed by Baker and Benjamin. We owe this point to Richard Johnson (see Johnson, 2000).

up of benefits was affected and, most pertinently, some evidence of a shift from part-time to full-time work. However this shift in general took the form of a shift in the number of weeks worked per year (+5 to 6 weeks) rather than a shift in hours per week. They argue that this result is consistent with a discrete shift fixed-hours of work model, as described by Hurd (1996), rather than incremental changes in hours around Point B in figure 6.1.

6.2 Modelling retirement with the UK earnings test

To analyse the problem, consider a simple two-period decision environment at state pensionable age. In the first period the individual decides whether to (continue to) work and whether to receive the flat state pension – yielding three possible options. He or she can retire immediately and start drawing the state pension. He or she can carry on working and defer pension receipt. Or else (s)he can carry on working, and start drawing the pension, in which case (s)he might be subject to the earnings rule.[77] In the second period, the individual receives a flat-rate pension, the value of which is conditional on the choice made in the first period.

Assume a general utility function:

$$U = U(c_1, l_1; \beta c_2, \beta l_2 \mid \theta) \qquad U_{c(.)} > 0,\ U_{l(.)} > 0$$

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[77] We ignore the fourth possible option – retire and defer pension receipt – by assuming no other available source of income.

where c is consumption and l is leisure (indexed by period), β is an individual discount factor ($0 < \beta < 1$) and θ is the (individual-specific) probability of surviving until the second period.[78]

We now write the budget constraint for the two period remaining lifetime, Y, for different options. If the individual retires immediately, total income is given by;

(1) $Y = p + \theta p$

where p is the flat (basic) pension.

If (s)he decides to continue to work and defer pension receipt, income is given by;

(2) $Y = w(1 - t) + \theta p(1 + r)$

where r is the adjustment of the pension arising from deferral and t is the average rate of tax which is payable when the individual is working but not when (s)he is retired.[79]

If (s)he works but does not defer pension receipt, total income is:

(3) $Y = w^* + \theta p$ *where*

(a) $w^* = (w + p)(1 - t)$ *if* $w < w_0$

(b) $w^* = (w_0 + p)(1 - t)$ *if* $w_0 \leq w < w_0 + p$

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[78] This might, in turn, be affected by the decision whether to carry on working, but this is not something we consider here.

$$(c)\ w^* = w(1-t)\ if\ w \geq w_0 + p$$

where the non-linearity in the wage outcome reflects the operation of the earnings rule.[80]

Faced with these different possibilities, what would an individual choose to do? Certain options can be eliminated fairly easily. For example, the individual would always choose 3(a) over 3(b) since in the latter case $\partial w^*/\partial w = 0$. So we might expect to see a 'bunching' of individuals at the kink point w_0 (point B in Figure 6.1). Also, a forward-looking individual should always choose (2) over 3(c) since the former augments the pension in period 2 by r. This reduces the effective choice to (1), (2) and 3(a). The actual decision will depend on the relative utility from leisure and consumption, the discount rate, the survival probability, the income tax rate and the deferral rate. These last four factors determine whether deferral is actuarially fair. For someone working, this requires that $(1-t) = \theta r$, although assuming $\beta < 1$ implies that an individual will require an actuarially favourable deferral rate in order to postpone retirement. Note that the tax system tends to favour deferral since all of the pension is likely to be taxed if the individual receives it now in addition to his or her earnings.

It is possible to distinguish four types of people.

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[79] Pension income is assumed not to be taxed since, in the UK, the value of the individual's personal tax allowance is at least as great as the value of the basic state pension.

[80] For simplicity, ignore the small segment of the budget constraint with a 50 per cent withdrawal rate.

- Type 1s retire and start drawing their pension in period one. They are likely to derive high utility from leisure relative to additional income and deferral is more likely to be actuarially unfavourable for them.

- Type 2s choose to work and earn at or less than the earnings test limit and start drawing their pension immediately. For them deferral is likely to be actuarially unfavourable and they derive relatively lower utility from any increased income they could get earning more than the earnings rule threshold.

- Type 3s are those who work and defer pension and for whom deferral is actuarially favourable.

- Type 4s are those who work and defer and for whom deferral is actuarially unfavourable, but who derive high utility from income relative to leisure and are therefore prepared to pay the tax implicit in deferral. Note, however, that the penalty they pay for earning above the earnings rule threshold is less than if there were no deferral option when they would lose θpr in the second period.

If the earnings test is abolished, (3) becomes;

(3') $Y = (w + p)(1 - t) + \theta p$

How does this affect the four types? Type 1s and Types 3s will be unaffected. Type 2s will tend to work more following the abolition of the earnings rule. They will have an incentive to increase their hours and earnings since $\partial Y/\partial w > 0$. Type 4s, for whom deferral is actuarially unfavourable, will no longer have to

defer if the earnings rule is abolished. As a result they will experience a positive income effect and could choose to reduce the number of hours worked.

A priori the impact of abolishing the earnings rule on work incentives depends on the relative numbers of Type 2s and Type 4s, and on the size of the implicit tax rate facing Type 4s who chose to defer when the earnings rule was in place. At the time of abolition, the government claimed that around 400,000 people would gain as a result (see Whitehouse, 1990). This total included 200,000 people who would choose to work and earn more and 200,000 who would gain because they would no longer have to defer their pension. Taken literally, the official figures imply a fairly equal split between Type 2s, who would work more following the abolition of the earnings rule, and Type 4s who were previously deferring at an actuarially unfair rate and who might choose to work less after the abolition of the earnings rule. In fact this 200,000 figure for the number of people who would gain from no longer having to defer their pension seems too high. It is closer to the total number of deferrers at the time of the change and will therefore include some people of Type 3.

What of married women? Given their longer life expectancy, women are more likely than men to be Types 3s, suggesting a gender-specific impact from abolition of the earnings rule. But the position is complicated by the fact that, before 1978, married women could opt to pay a reduced rate of National Insurance contribution, which meant that they did not qualify for a basic state pension in their own right. However couples in which one partner did not qualify would receive a dependant's addition. So married women may have been

indirectly affected by the reform through its effect on their spouses' behaviour.

Again, there are several cases. The first case is women married to Type 2 men, i.e. men who are likely to increase their hours as a result of the earnings rule being abolished. This will cause a positive income effect for the wife who, if she is working, is likely to reduce her hours – or stop working altogether. The second and third cases are both women married to Type 4 men, i.e. those for whom deferral is actuarially unfair and who choose to start drawing their pension once the earnings rule is abolished. The distinction lies in whether the husband takes account of the lifetime of the couple in assessing whether deferral would be actuarially unfair, or only their own lifetime. If the former, then abolishing the earnings rule and allowing the husband to draw the pension immediately will have a positive income effect for both spouses. If the latter, then there may be some wives who experience a fall in their total incomes following the abolition of the earnings rule if their husbands choose not to defer. For members of this third group the abolition of the earnings rule has a negative income effect, which could cause them to increase their hours of work. If they do not, then abolition of the earnings rule could in the longer term, generate higher levels of poverty among elderly widows. Overall, we might expect to find less clear cut results for women than for men.

6.3 Empirical analysis

The strategy for evaluating the effect of abolishing the earnings rule is a simple "differences-in-differences" approach. This looks at changes in the hours and earnings of the "treatment group" who were affected by the reform (men aged 65-

69 and women aged 60-64), before and after the earnings rule was abolished (defined as April 1984 – September 1989 and October 1989 – March 1994). To control for the potential effect of other factors over the same period, such as business-cycle effects, changes in the earnings and hours of the treatment group are compared with changes in the same variables among a control group who were not affected by the reform, but would have been affected by the other factors. In practice, there are two comparison groups. The first consists of men and women five years before state pension age (i.e. men aged 60-64 and women aged 55-59) who remained ineligible for the state pension throughout. The second consists of older men aged 70-74 and women aged 65-69 who could receive the state pension without being subject to earnings rule throughout. There are a number of reasons for thinking that the older group would act as a better control, but low levels of employment among this group make for small sample sizes. Using the younger control group therefore increases the available number of observations.[81]

To identify the effect of the reform from a differences-in-differences approach, two conditions must be satisfied (Angrist and Krueger, 1999). First, the composition of the groups must be stable across time and second, the control and treatment group must be subject to (and react in the same way to) macro trends. For the younger control group, both conditions may be violated.

Figure 1.1 in chapter 1 shows employment rates among the three age groups (treatment and two control groups) for men between 1968–2002. The period of

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[81] An attempt was made to increase sample size by splicing in additional data from the General Household Survey, but inconsistent data definitions precluded this strategy yielding useful results.

analysis of the earnings test (1984–94) comes after the biggest fall in employment among 60-64 year olds, but nevertheless, there appear to be differences between the trend in employment of this group and that of the 65-69 age group. As seen in chapter 4, employment among the younger age group is likely to be heavily influenced by occupational pension incentives, which is not true of the older age groups. Also, the balance between full-time and part-time workers is quite different in the younger male cohort compared to the treatment group and is much more similar in the treatment group and the older cohort. Since full-time and part-time workers might be differentially affected by macro factors, this also will tend to make the younger cohort a less valid control.

Finally, there may be spillover effects from the reform to the younger control group. This is a potential problem if members of the younger control group change their labour market behaviour in anticipation of no longer having to face the earnings rule when they reach state pension age. The effect on labour supply could go either way. If there are significant tenure effects then abolition of the earnings rule might create a stronger incentive for younger workers to work now. Any positive income effect would tend to work in the other direction.[82]

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[82] There could be a potential problem if we used data from after 1994 when the older cohort of people would include those people who were in the treatment age range when the reform was made. If there were employment dynamics such that hours and earnings decisions taken when 65-69 affected hours and earnings decisions when 70-74 then the older group would not be a proper control.

Because of these potential problems with the younger control group, in the analysis that follows, results are presented using just the older control group, and using the older and younger combined.

The data are taken from the Family Expenditure Survey from April 1984 – March 1994. The FES contains reliable and consistent information on employment status, hours worked and earnings that allows us to look at employment before and after the abolition of the earnings rule, as well as information on individuals' state pension income that permits an assessment of the extent to which individuals defer pension receipt. Table 6.2 shows the sample sizes for the 'treatment' group and the two 'control' groups. Among the older age groups participation rates are very low and pooling across a number of years is necessary to increase sample sizes when looking at hours and earnings.

Table 6.2

Sample sizes

		Pre-reform		Post-reform	
		All	Employed	All	Employed
Treatment	Men aged 65-69	2111	160	1713	128
Control 1	Men aged 60-64	2185	888	1558	511
Control 2	Men aged 70-74	1573	77	1371	67
Treatment	Women aged 60-64	2697	450	1916	338
Control 1	Women aged 55-59	2399	1125	1718	838
Control 2	Women aged 65-69	2576	134	2017	119

Source: Family Expenditure Survey 1984 – 94

Figure 6.2A plots the distribution of earnings (in constant 1989 prices, adjusted

using an earnings index) for men aged 65-69 when the earnings rule was in place and after its abolition, for positive earnings. Figure 6.2B presents the same data for women. We focus on the period after April 1986 since from this time the earnings rule thresholds were unchanged in nominal terms. The earnings rule did appear to have had some impact on earnings for men and women. The rule made some allowance for work-related costs, which will have had a smoothing effect on any potential 'kink' in the distribution of earnings at the threshold. Even so, there is some bunching in the distribution of male and female earnings around the £75 threshold, although in neither case is the mass of the distribution to be found around these points. Interestingly, the largest spike in the distribution for men occurs around £40 a week, reflecting the Lower Earnings Limit for National Insurance contributions, even though employees over state pensionable age are not liable for National Insurance contributions. After abolition there is some evidence, from 'eye-balling' the distributions, of a reduction in the spike at £75 and of greater frequencies at higher earnings for both the male and female distributions.

Fig. 2A Distribution of male weekly earnings

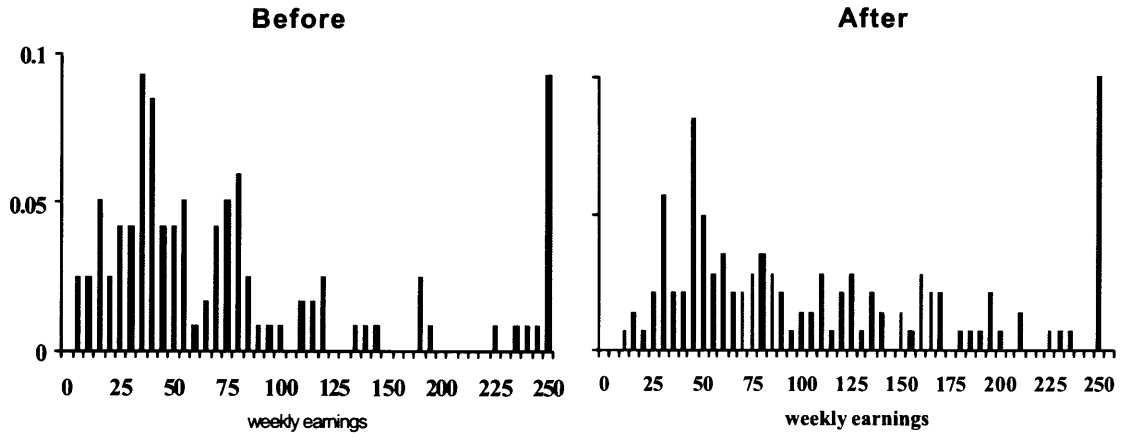


Fig. 2B Distribution of female weekly earnings

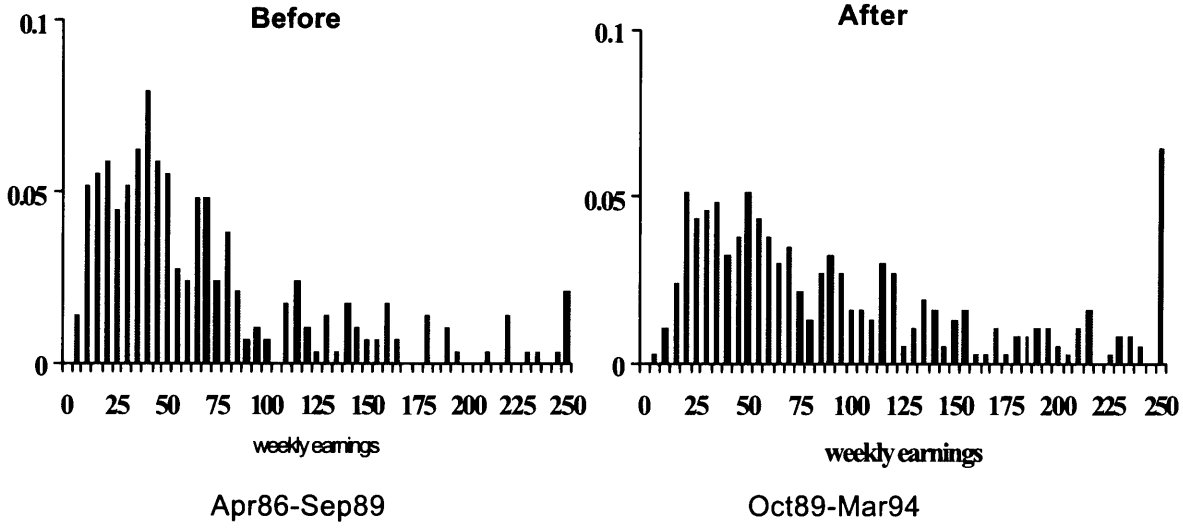


Table 6.3 summarizes participation and average hours for the treatment and control groups before and after abolition of the earnings rule. The only significant

change in participation occurs for younger men. The fall in employment among this group – and the likely effect of this on the sample composition of workers in this age range – poses problems for using younger men as a control group.

Table 6.3

Participation and hours, before and after the reform

	Participation (%)		Hours (>0)		
	Pre	Post	Mean Pre	Mean Post	*Rank sum Test*
Men 65-69	7.58	7.47	22.43	26.27*	*2.266*
Men 60-64	40.64	32.80*	40.62	40.35	*0.560*
Men 70-74	4.90	4.89	17.81	18.40	*1.041*
Women 60-64	16.39	17.64	21.06	22.89*	*1.611*
Women 55-59	46.89	48.78	27.09	27.06	*0.407*
Women 65-69	5.20	5.90	15.32	16.59	*0.802*

* change significant at 5 per cent level

In contrast, the evidence clearly suggests that the abolition of the earnings rule had a significant effect on the number of hours worked by men. A Wilcoxon rank-sum test rejects the null that the pre and post-reform distributions are independent samples from populations with the same distribution (Table 6.3). The average number of hours worked by men in the treatment group increased significantly, by nearly four hours per worker, despite no significant change in average hours, or in the distribution of hours, among the older or younger cohort over the same period.

This is confirmed by regression analysis. Weekly hours for individuals

in the three groups are regressed on a set of dummies for the treatment and younger control groups and a dummy for the period after the abolition of the earnings test. An interaction term is included that takes the value one for the treatment group in the post-reform period to pick up any differential change in the hours of this group after the reform relative to the two control groups. Both OLS and Tobit regressions were run; the latter to handle the left censoring of the data. The Tobit estimates are depicted here, although there is in fact little difference in the results using the two estimators.

The results for men are summarised in Table 6.4. Combining the two control groups, there is a significant increase in the average number of weekly hours – around four hours a week – worked by members of the treatment group relative to the controls after the reform. Excluding the younger control group, there is still an increase of just over three hours a week, although the reduction in sample size increases the standard error and the coefficient is significant only at the 10% level.

Table 6.4

Regression results (men)

	Tobit – hours worked per week		Probit – worked more than 40 hours		Tobit – weekly earnings	
Control groups	Older and younger	Older only	Older and younger	Older only	Older and younger	Older only
Treatment group	4.121**	3.594*	0.208**	0.080*	14.18	13.93
	(1.334)	(1.887)	(0.082)	(0.047)	(12.27)	(15.54)
Younger control	22.248**	—	0.488**	—	148.51**	—
	(1.000)		(0.033)		(12.37)	
Post-reform dummy	–0.294	0.778	–0.018	–0.035	–15.51**	–13.64
	(0.611)	(2.246)	(0.027)	(0.076)	(7.51)	(18.50)
Treatment* Dummy	**4.150****	**3.130**	**0.227****	**0.176***	**42.36****	**40.12***
	(1.474)	**(2.760)**	**(0.066)**	**(0.113)**	**(18.14)**	**(22.74)**
No. obs	1781	429	1781	429	1781	429
Log likelihood	–6836.21	–1722.49	–1108.85	–161.70	–11301.9	–2627.09

Standard errors in parentheses. The regressions control for education, marital status, presence of children in the household, spouse's age, employment and education.

Earnings are adjusted by a wage index calculated using FES data for male employees aged 20-64.

* change significant at 10 per cent level ** change significant at 5 per cent level

Table 6.4 also shows the marginal effects from a probit regression on whether or not the individual works 40 or more hours a week. There is a significant increase in the proportion of men in the treatment group working more than 40 hours a week after the reform compared to the control group. This result strongly

suggests that we are observing discrete shifts from part-time to full-time work, as conjectured by Zabalza et al (1980) and Baker and Benjamin (1999), rather than incremental adjustments of hours which, given the argument of Section 2, might be expected to reduce hours among those higher earners for whom the earnings rule abolition induces a notional positive income effect.[83]

Finally, Table 6.4 summarises the results of a regression of earnings on the same variables and shows a positive and significant increase in the earnings of the treatment group after the reform compared when both control groups. Again, small sample size limits the significance of the comparison with the older control group. Note that the increase in earnings of the control group more than offsets a reduction in earnings in the post-abolition period across all groups.

Table 6.5 replicates Table 6.4, but for women. Similar results are obtained, although the coefficient estimates are lower. The abolition of the earnings test raises average hours by just over two hours a week, and average earnings by just over £20 per week, but these results disappear when only the older control group are used, despite the larger sample size compared to men. A Wilcoxon rank-sum test fails to reject that the distribution of hours are the same before and after the

[83] We experimented with various cut-offs of hours to capture any income effects inducing reductions in hours among full-time workers, without success. It is possible of course that earnings cut-offs, rather than hours, might find evidence of such opposite effects and indeed Friedberg (2000) does find very small such effects.

reform, but the increase in the average number of hours worked among the treatment group is significant at the 5% level.[84]

Table 6.5

Regression results (women)

	Tobit – hours worked per week		Probit – worked more than 40 hours		Tobit – weekly earnings	
Control groups	Older and younger	Older only	Older and younger	Older only	Older and younger	Older only
Treatment group	5.214** (1.026)	6,288** (1.266)	0.172** (0.048)	0.171** (0.040)	21.98** (6.15)	33.54** (6.74)
Younger control	11.430** (0.860)	—	0.372** (0.033)	—	54.07** (5.15)	—
Post-reform dummy	–0.186 (0.584)	2.070 (1.597)	–0.029 (0.024)	–0.070 (0.065)	–25.35** (3.50)	–1.94 (8.50)
Treatment* Dummy	**2.350** (1.082)**	**–0.298 (1.850)**	**0.103** (0.046)**	**0.018 (0.071)**	**23.83** (6.48)**	**–0.41 (9.84)**
No. obs	2694	984	2694	984	2694	984
Log likelihood	–10587.2	–3877.03	–1681.54	–546.48	–15410.0	–5522.09

Standard errors in parentheses. The regressions control for education, marital status, presence of children in the household, spouse's age, employment and education.

Earnings are adjusted by a wage index calculated using FES data for male employees aged 20-64.

* change significant at 10 per cent level ** change significant at 5 per cent level

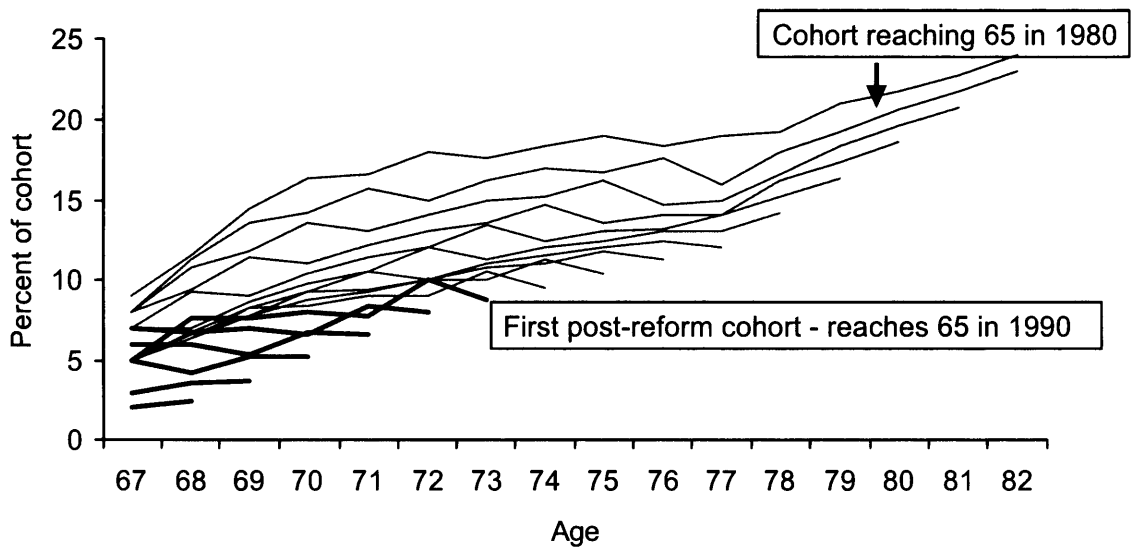
[84] Given the argument in Section 6.2, it would be nice to pin down the possible different behaviour of wives, single women (never married versus widows and divorcees). Small sample sizes preclude this.

Deferral

There is little evidence of a reduction in hours among high earners caused by a positive income effect among people of type 4 (i.e. those who previously chose to work and defer at an actuarially unfair rate). One possible explanation is that for most people who chose to defer their pension, deferral was in fact actuarially favourable given their individual expected longevity. In this case, we would not expect to see a large fall in the number of people who chose to defer after the reform.

Figure 6.3 shows cohort profiles of the proportion of men who received increments to their pension as a result of deferral, derived from published official statistics (DSS, *Social Security Statistics*, various years). The cohorts are defined according to the year in which people reach state pension age. The oldest cohort comprises those who reached 65 in 1980. At younger ages, the cohort profiles rise, reflecting an increasing number of the cohort who have retired after state

Figure 3: Proportion of men in receipt of deferred pension, by cohort



6.4 Conclusions

The *a priori* effect of abolishing earnings tests for social security on work incentives is ambiguous. People who are currently earning at or near the earnings test threshold are likely to have an incentive to work more. But a second group of people will experience a positive income effect as a result of abolishing the earnings test and this second group may actually reduce their hours and earnings. In practice, the option to defer pension receipt reduces the size of the penalty associated with earning above the earnings test threshold. Indeed if deferral were actuarially fair it would eliminate the penalty of the earnings test altogether – and any positive income effect arising from its abolition.

The earnings test, known as the earnings rule, was abolished in the UK in October 1989. The estimates presented here suggest that the reform had a positive effect on the hours and earnings of men and women, although the net impact on women is lower, as our discussion of family responses would suggest. Among male participants in the affected age range there was an increase of between 3 – 4 hours per week, and for women, perhaps 2 hours a week. To get some idea of the magnitude of this effect, an earnings response of this size would generate additional tax revenue for the government of around £20 million per year (in 1989 prices).

There is no evidence of any reduction in hours that would arise as a result of a positive income effect from abolishing the earnings test. The explanation for this finding is that most of those who chose to defer did so because, for them, deferral was actuarially favourable. Support for this hypothesis comes from the fact that

there is little indication of a significant reduction in deferral after the earnings test was abolished.

Two *caveats* are in order. First, the younger control group is not ideal, and the results are much weaker when only the older control group is used, given its small sample size. Second, the 'differences of differences' approach used here does not permit any structural modelling, in particular of the decision to participate (not to retire) and how many hours to supply conditional on participation. An alternative, given the clean test offered by the UK experience, would be to nest the policy 'experiment' within a structural approach to labour supply.

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